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ERRATA

VOLUME XIII

page 357 lines 4–5 for 'British Guiana' read 'Surinam'
(Sugarcane mosaic is still unrecorded for British Guiana; cf. map 299)

VOLUME XXXIII

474 line 36 for 'ZOLTÁN (K.)' read 'KOVÁTS (Z.)'

VOLUME XXXIV

663 43 for 'Naumov' read 'Naumova'

VOLUME XXXV

137 33 for '**31**, p. 740' read '**31**, p. 526'
236 23 for '*alba*' read '*mori*'
321 3 for 'BJÖRKLING' read 'BJÖRLING'
551 6 for 'GIEBER' read 'GIERER'
556 14 for '*kalkoffi*' read '*kalkhoffi*'
727 8 for 'KLUEPPEL' read 'KLUEPFEL'
767 38 for '**35**, p. 180' read '**35**, p. 188'

VOLUME XXXVI

3 1 for '*C. cucumerinum*' read '*Cladosporium cucumerinum*'
4 30 for '0·1 to 0·2' read '0·01 to 0·02'
6 24 insert 'both' before '*Helicobasidium*'
for '*Helicobasidum*' read '*Helicobasidium*'
22 23 for '*Puccinium*' read '*Puccinia*'
27 5 for '*limetticolum*' read '*limetticola*'
29 26 for 'Tochiani' read 'Tochinai'
30 3 for 'SCANZERLA' read 'SCANGERLA'
37 9 delete '[*R. nigricans*]'
14 for '*R. nigricans*' read '*R. stolonifer*'
69 36–37 for *sparganiodes*' read '*sparganioides*'
for '*coerulescens*' read '*caerulescens*'
91 25 for '*pratensis*' read '*pratense*'
97 14 for '**25**, p. 145' read '**24**, p. 145'
177 32 for '*macrorhiza*' read '*macrorrhiza*'
190 18 for '[**33**, p. 125]' read '[**31**, p. 125]'
43 after '*Cyamopsis tetragonoloba*' insert '[*C. psoraloides*]'
202 18 for '*pyriformis*' read '*piriformis*'
213 43 for '*Attractium*' read '*Atractium*'
230 19 for 'grain' read 'gram'
252 36 for '**35**, pp. 799, 874' read '**35**, pp. 779, 874'
266 43 for '[**36**, p. 62]' read '[**36**, p. 52]'
276 16 for '*polysora*' read '*sorghi*'
for '237' read '279'

page 290 line 40 delete '*Dothichiza*'
323 17 for '*levis*' read '*laevis*'
323 17 delete '[? *M. divisus*]'
18–19 for '*NachrBl. dtsch. PflSchDienst, Berl.*, N.S., 7, p. 162, 1955' read '*NachrBl. dtsch. PflSchDienst Braunschw. Stuttgart*, 7, pp. 161–164, 1955'
335 15 for 'SIMONDS' read 'SIMMONDS'
342 1 for '*heteromorphum*' read '*heteromorpha*'
357 30, 33 for '*Perenospora*' read '*Peronospora*'
359 28 for '*P. assymmetrica*' read '*P. asymmetrica*'
374 30 for '[*H.*]' read '[*S.*]'
380 20 for '*1955–6*' read '*1954–5*'
382 19 for '*Hormodendron*' read '*Hormodendrum*'
383 14 for '*Trachysphaeria*' read '*Trachysphaera*'
384 33 for '*berkleyii*' read '*berkeleyii*'
389 23 for 'mildy' read 'mildly'
397 16 for '**11**' read '**2**'
405 18 for '*cephalosporoides*' read '*cephalosporioides*'
410 40 for 'GALLUCCI-RANGONE' read 'RANGONE GALLUCCI'
430 36 for 'EDGINGTON (I. V.)' read 'EDGINGTON (L. V.)'
440 16 after '*Coniophora cerebella*' insert '[*C. puteana*]'
443 7 for '*foliarum*' read '*foliosum*'
445 15 for '12–18 months' read '1 to 1·5 months'
448 for 'aphid' read 'leafhopper'
484 31 for 'Naumov' read 'Naumova'
512 28 for 'SHOICHI (H.)' read 'HIRATA (S.)'
562 48 for '*Rep. For. Prod., Lab., U.S. Dep. Agric., For. Serv.*' read '*Rep. For. Prod. Lab., Madison*'
626 33 for 'BIRKINSHAW (R. H.)' read 'BIRKINSHAW (J. H.)'
629 14, 21 for 'pimaricine' read 'pimaricin'
646 45 for '(*M. lignicola*)' read '(*M. ligulicola*)'
652 6 for '18' read '28'
664 21 for 'fungus' read 'pathogen'
670 13 for 'BONDARTSEV' read 'BONDARTSEVA'
671 2 for '*quercina*' read '*quercinum*'
672 4 for '*alphitoides*' read '*quercina*'
677 21 for '*elliottii*' read '*elliotii*'
683 47 after '*Omphalia flavida*' insert '[*Mycena citricolor*]'
51 for 'var. *sojensis*' read 'var. *sojense*'
684 18 after '*P. recondita*' insert '[*P. triticina*]'
739 49 for '*For. Prod. J.*, **7**' read '*For. Prod. J.*, **6**'
740 25 for '*kaufmanii*' read '*kauffmanii*'
743 18, 23, 27 for 'aphid' read 'insect'
761 1 for '*aurantiae*' read '*auran[illegible]*'
800 3 for 'decay' read 'death'
804 18 for '*cochliobolus*' read '*cochlioides*'

COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
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Literature references in [ ] refer to the *Review of Applied Mycology*.
Map references are to the C.M.I. distribution maps of plant diseases.

CASTELLANI (E.). **Esperienze di lotta contro i tumori batterici del Ricino a mezzo di applicazioni locali di una sostanza antibiotica.** [Experiments on the control of bacterial tumours of *Ricinus* by means of local applications of an antibiotic substance.]—*Olearia*, 9, 9–10, pp. 210–212, 3 figs., 1955. [French, English, and German summaries.]

In an experiment at the Institute of Plant Pathology, University of Turin, Italy, *Ricinus* plants 20 days old were wounded in the stems in two places and inoculated with a culture suspension of *Agrobacterium tumefaciens*. Three weeks later, well-developed tumours had developed near the inoculation sites, and cotton wool steeped in a culture fluid of *Oospora virescens* was applied to them, cotton wool soaked in sterile water being applied to the controls.

The wool was kept in position for a week. At the end of this period, the control tumours were turgid and still developing, whereas those treated with the culture fluid had a brown, cracked surface and were completely necrotized, though the surrounding tissues that had also come into contact with the culture fluid were only faintly discoloured. No further growth of the treated tumours occurred.

MARINI (E[NRICA]). **Una virosi apparsa sul Basilico (Ocimum basilicum).** [A virosis present on Basil (*Ocimum basilicum*).]—*Riv. Ortoflorofruttic. ital.*, 39, 7–8, pp. 360–362, 2 figs., 1955.

In the summer of 1954, basil (*Ocimum basilicum*) plants growing in a large market-garden near Milan, Italy, developed a mosaic pattern on the leaves, which became malformed, the affected plants being dwarfed. Inoculations of White Burley tobacco, *Nicotiana glutinosa*, and bean (*Phaseolus vulgaris*) with sap from affected basil gave slight symptoms of mosaic on the tobacco plants only. Reinoculation of healthy basil plants with sap from the inoculated tobacco again reproduced the disease, which was tentatively identified as cucumber mosaic virus. This diagnosis was subsequently confirmed by Noordam and Thung at Wageningen, Holland.

FRANCO (E.). **A doença estriada da Cana de Açúcar.** [The streak disease of Sugar-Cane.]—*Brasil açuc.*, 47, 1, pp. 74–80, 1956.

This is a useful summary of the available information on chlorotic streak virus of sugar-cane in connexion with its occurrence in Sergipe, Brazil [map 29], where it was first observed in August, 1950, on the P.O.J. 2878 variety. The disease has since spread to Co. 290 and the newly released Co. 331, C.B. 3624, and C.B. 3614, causing a rapid fall in production. The virus is transmitted from diseased to healthy plants by *Tomaspis liturata* var. *ruforivulata*.

Steib (R. J.), Farrar (L. L.), Forbes (I. L.), & Chilton (S. J. P.). **Occurrence of the ratoon stunting disease in Louisiana and its control by use of hot-air treatments.**—*Sug. Bull., N. Orleans*, 34, 20, pp. 302–303, 306, 1956.

Further data are presented to demonstrate the efficiency of the hot-air treatment of sugar-cane in an electrically heated, thermostatically controlled oven for the control of ratoon stunting virus in Louisiana [35, p. 721]. In the series of trials reported infection was almost uniformly reduced from high percentages (up to nearly 100) in field-run material to a trace or nil.

Antoine (R.). **La maladie du rabougrissement des repousses.** [The ratoon stunting disease.]—*Rev. agric. Maurice*, 34, 6, pp. 259–275, 2 pl., 1955.

Most of this information on the ratoon stunting virus disease of sugar-cane and its occurrence and control in Mauritius [35, p. 845 and next abstract] has already been noticed in this *Review*. A programme is discussed for the heat treatment of canes to obtain sufficient quantities of healthy planting material.

Antoine (R.). **Maladies de la Canne à Sucre.** [Diseases of Sugar-cane.]—*Rev. agric. Maurice*, 35, 2, pp. 78–81, 1956.

The author further discusses the control of ratoon stunting virus disease of sugar-cane in Mauritius [see preceding abstract], stating that the control measures previously recommended [34, p. 818], while partially effective, do not completely eliminate the disease. The information on chlorotic streak, red stripe [*Xanthomonas rubrilineans*], and the use of mercurial dips after hot-water treatment has already been noticed from another source [35, p. 846].

Edgerton (C. W.). **Sugarcane and its diseases.**—290 pp., 38 figs., 1 graph, Baton Rouge, Louisiana State University Press, 1955. $5.

Part I of this treatise deals with the history, structure, classification, breeding, and varieties of sugar-cane. In the second part diseases of sugar-cane are described under headings including stalk rots, smut, leaf lesions and spots, mildews, malformations, bacterial diseases, root rots, minor diseases, and virus diseases. Stress is placed on diseases occurring in Louisiana, but important information on those in other countries is also included. There is a comprehensive list of 669 selected references and the book is well illustrated with photographs.

Zenteno Zevada (Martha), Yerkes (W. D.), & Niederhauser (J. S.). **Primera lista de hongos de Mexico arreglada por huespedes.** [First list of Mexican fungi arranged under hosts.]—*Foll. téc. Ofic. Estud. esp. Méx.* 14, iv+43 pp., 1955.

This first systematic list of Mexican fungi [28, p. 144] to be published is arranged under hosts grouped in families, the locality of collection being indicated. The list is based largely on specimens deposited in the Cryptogamic Herbarium of the Office of Special Studies. Some fungi listed, however, are taken from the 109 items of literature cited [31, p. 370]. A short list of phytopathogenic bacteria is also provided. The following are included: *Sphacelotheca reiliana* on *Euchlaena mexicana* and maize, *S. sorghi* on sorghum [33, p. 281] and *Sorghum halepense*, *Piricularia oryzae* and *Neovossia horrida* on rice, *Peronospora destructor* on onion, *Mycosphaerella brassicicola* and *Plasmodiophora brassicae* on cabbage, *Fabraea maculata* on pear, *Podosphaera leucotricha*, *Rosellinia necatrix*, and *Venturia inaequalis* on apple, *Diplocarpon rosae* on rose, *Pseudopeziza jonesii* and *Urophlyctis alfalfae* on lucerne, *Sclerotinia trifoliorum* on clover and lucerne, *Pseudomonas* [*medicaginis* f.sp.] *phaseolicola* on bean (*Phaseolus vulgaris*), *Rhizoctonia violacea* [*Helicobasidium purpureum*] on clover, *Corticium salmonicolor* on orange, *Plasmopara viticola* on vine, *Puccinia menthae* on *Calamintha macrostema*,

Corynebacterium michiganense and *Septoria lycopersici* on tomato, *C. cucumerinum* on *Cucumis* sp., *Synchytrium endobioticum* on *Solanum* sp., *P. antirrhini* on antirrhinum, *Cercospora coffeicola* on coffee, *Xanthomonas vasculorum* and *X. rubrilineans* on sugar-cane, and *X. malvacearum* on cotton.

Morwood (R. B.). **A preliminary list of plant diseases in Fiji.**—9 pp., Department of Agriculture, Fiji, 1955. [Mimeographed.]

This preliminary list of plant diseases in Fiji is prepared from observations made from June, 1952, until 1955 during a survey for the Colonial Development and Welfare Scheme and from published records [35, p. 423]. The list is arranged alphabetically under hosts with references where applicable to a bibliography at the end. The records include *Isariopsis griseola* [map 328] and *Uromyces appendiculatus* [map 290] on bean [*Phaseolus* sp.], *Xanthomonas campestris* on cabbage [map 136], *Fomes noxius* on cacao [map 104], *Sclerotium rolfsii* on various hosts [map 311], *X. citri* on citrus [map 11], *Cercospora coffeicola* [map 59] and *Corticium koleroga* [map 64] on coffee, *Pseudoperonospora cubensis* on cucurbits [map 285], *Alternaria solani* on eggplant, potato, and tomato [map 89], *Puccinia sorghi* [map 279] and *Ustilago zeae* [*U. maydis*: map 93] on maize, *Claviceps paspali* on *Paspalum* [map 90], *Cercospora personata* [*Mycosphaerella berkeleyii*] on groundnut [map 152], *Phytophthora cinnamomi* on pineapple [map 302], *P. infestans* on potato [map 109], *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on rice [map 92], *Sphaerostilbe repens* on rubber [map 288], *Puccinia purpurea* on sorghum and Sudan grass [map 212], *M. fragariae* on strawberry [map 110], *C. nicotianae* on tobacco [map 172], and *Cladosporium fulvum* on tomato [map 77].

Riley (E. A.). **A preliminary list of plant diseases in Northern Rhodesia.**—*Mycol. Pap. Commonw. Mycol. Inst.* 63, 28 pp., 1 map, 1956.

Bacterial, fungus, and virus pathogens and physiological disorders of plants in Northern Rhodesia are listed under the hosts arranged alphabetically according to their Latin names, notes on symptoms and control being provided where applicable and the provinces in which the diseases have been recorded being indicated. There is an index to pathogens and disorders and a list of vernacular host names with their Latin equivalents. The author also names those diseases for which a watch is being kept and which up to the present have been excluded from Northern Rhodesia.

Ahmad (S.). **Ustilaginales of West Pakistan.**—*Mycol. Pap. Commonw. Mycol. Inst.* 64, 17 pp., 8 figs., 1956.

In this paper, comprising the results of a survey begun in 1948, 87 species of Ustilaginales occurring in West Pakistan, including eight new ones, are listed, with descriptions of those species not included by Mundkur and Thirumalachar [32, p. 103]. Keys are provided to the families and genera and there is a host index.

New or uncommon plant diseases and pests.—*Plant Path.*, 5, 2, pp. 75–76, 1 fig. (between pp. 56 and 57), 1956.

W. F. Cheal and R. E. Taylor report that during inspections of grassed-down plots of Fuggle clone N hops at Rosemaund Experimental Husbandry Farm, Hereford, in October, 1955, perithecia of *Gibberella pulicaris* [18, p. 760] were found in abundance on many of the crowns where these had been cut back during the previous winter and left exposed, earthing up in summer not being possible owing to the grass.

C. C. V. Batts notes that in preliminary cross-inoculation experiments carried out in the summer of 1955, ergot [*Claviceps purpurea*] from *Alopecurus myosuroides* [34, p. 769] readily infected wheat.

KEYWORTH (W. G.). **Plant Pathology Report.**—*Rep. nat. Veg. Res. Sta., Warwick, 6 (1955)*, pp. 50–55, 1956.

This report [cf. 35, p. 137], covering the period October, 1954, to September, 1955, refers to further work on crook root of watercress [*Spongospora* sp.], in which J. A. TOMLINSON studied growth in miniature beds separated by concrete and given a controlled artesian water supply. Addition of sufficient carbon dioxide to the inlet water to maintain a high concentration at the outlet and overcome the usual reduction in carbon dioxide content as the water flows down the bed had no effect on the disease, nor had the addition of ferrous sulphate or sodium metaphosphate to the water, separately or together. Injection of water from above the inlet (and therefore presumed free from zoospores of the pathogen) into the centre of a bed resulted in less disease and increased plant growth near the point of entry. Increase of calcium bicarbonate up to 500 p.p.m. in distilled water tended to suppress the disease and the effect of raising the concentration in commercial beds (usually between 300 and 400 p.p.m.) is now being investigated.

With the exception of a few crops raised from seed all commercial watercress crops examined showed a range of virus-like symptoms. Isolates from several widely separate sources produced similar symptoms in several cruciferous plants and in one variety of watercress, but dissimilar symptoms in *Chenopodium amaranticolor*. A number of isolates produced symptoms recalling cabbage black ring spot virus on certain of the indicator plants. Vegetative propagation from infected stock is probably responsible for the spread of virus diseases of watercress, but possible insect transmission is being investigated.

Continuing their study of silvering disease of red beet [*Corynebacterium* sp.], W. G. KEYWORTH and J. SHEILA HOWELL have confirmed that it is seed-transmitted and that considerable spread occurs in the steckling bed, probably by rain splashing. Silvering symptoms around apparent insect bites suggested insect transmission, but this was not achieved experimentally with flea beetles or caterpillars. Control by heat treatment of the seed is under investigation but samples vary widely in heat tolerance. Seed treatment with 0·1 to 0·2 per cent. streptomycin gave almost complete control in the steckling beds. In cultural studies the bacterium, though somewhat similar to *C. michiganense*, appeared to be a new species.

The same workers experimenting with hot water treatment of cuttings to control rust [*Puccinia menthae*] on mint [cf. 28, p. 106] found that 46° C. might prove lethal if planting conditions were adverse, but that 44° gave good survival, and a high degree of freedom from rust until July or August, though subsequent widespread occurrence of the disease may militate against this as a commercial practice. Two strains of *Mentha spicata* were found showing rust resistance.

In further work on stem and root rot of tomato [*Didymella lycopersici*: cf. 35, pp. 243, 656] DOROTHY E. FISHER and J. M. WAY found that seed treatment by hot water or dry heat is not practicable as the thermal death point of the fungus is too close to that of the seed. Seed can remain infected for as long as three years. Chemical seed steeps are now under test, external infection being estimated by placing seeds individually on the calyx scars of green tomatoes and incubating for three weeks. The tomatoes act as a selective medium for *Didymella*, suppressing the other contaminants. Plants grown for the second time where infected haulms and fruit were buried in 1953 developed little or no infection, in marked contrast with the 30 and 54 per cent., respectively, recorded in the previous year. Hot dry weather may have been responsible The ascospores of *D. lycopersici* produced cultures of at least two types, both of which were pathogenic to tomato but only produced perithecia after fusion. Certain varieties of *Lycopersicon hirsutum* have exhibited some root resistance and slight stem resistance to the disease.

A. G. CHANNON, reporting further work on rhubarb virus, stated that sap extracts from rhubarb plants showing various types of ring spot and other virus leaf

symptoms all induced similar necrotic local lesions when inoculated into tobacco. Ten such virus isolates from plants from widely separate sources showing ring spot symptoms were inoculated into rhubarb stocks, and thence into various host plants known to be susceptible to cabbage ring spot, all of which they infected in varying degree. Difficulty in transmitting the viruses from rhubarb to other hosts may be due to the presence of an inhibitor.

Investigation of parsnip canker [cf. 35, p. 862] by the same worker showed that even after reduction of carrot fly [*Psila rosae*] damage with dieldrin to six or eight per cent., some 80 per cent. of the roots on trial plots were still affected by canker, though the wet summer may have been partly responsible.

J. M. Way carried out a comparative trial of captan, TCNB [tetrachloronitrobenzene], and thiram, sprayed at 21-day intervals (from 4th October to 6th April) on to Imperial lettuce under Dutch lights, the effectiveness of the treatments being judged by the incidence of *Botrytis* [*cinerea*] and other diseases in the field after planting out. Thiram at 0·33 and 0·66 per cent. was best, closely followed by captan at 0·25 [cf. 35, p. 306]. TCNB failed to prevent infection in the field. Isolations made late in the season revealed *Botrytis* as the most important pathogen at that stage.

Salzmann (R.). **Tätigkeitsbericht der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1955.** [Report on the work of the Agricultural Experiment Station Zürich-Oerlikon for the year 1955.]—*Annu. agric. Suisse*, (57), N.S. 5, 4, pp. 285–353, 4 figs., 1956.

This report contains the following information of phytopathological interest [cf. 35, p. 90]. In the area supervised by the German-Swiss Seed Potato Association the average incidence of severe virus infection in 724 certified plots of class A (1954 harvest), determined by the Igel-Lange test, a micro-colorimetric procedure which is particularly useful in the early diagnosis of leaf roll and severe mosaic [potato virus Y], was 2·2 per cent., the corresponding figure for 1,903 plots of class B being 8·2 (previous year 3·6 and 10·8, respectively). Persistent wet weather retarded the onset of the summer flight of the vector *Myzus persicae* and reduced the population to the lowest observed since 1951. Although a slight reduction in the incidence of viroses may be effected by spraying with systemic insecticides (but only when combined with early harvesting), spraying is not recommended on account of its unreliability, relatively high cost, and such undesirable effects as toxicity. Roguing of diseased plants at the earliest practicable date is considered to be the most dependable and efficient method for the production of high-quality 'seed' [cf. below, p. 53]. Two new foci of potato wart disease [*Synchytrium endobioticum*] in the St. Gall Rhine Valley were notified during 1955.

Five physiologic races were found to be represented among the 34 collections of wheat brown rust [*Puccinia triticina*] made in 10 cantons during 1954 and 1955. Yellow rust [*P. glumarum*] was exceptionally severe, the epiphytotic involving all the countries of northern and central Europe and posing problems which can only be solved by international co-operation. Ten countries are already participating in joint experiments.

Two tests were carried out in the foothills of the Alps, where winter wheat is liable to heavy damage by dwarf bunt [*Tilletia controversa*: see below, p. 16], to ascertain the feasibility of its replacement by summer varieties. Among those tested (15 in each trial), two Austrian [unnamed], Lichti, Erli, and selections of Newthatch × Huron gave the highest yields.

In the final series of three years' experiments with summer barley in Schaffhausen, Zürich-Affoltern, and Grisons, a specially low degree of susceptibility to mildew [*Erysiphe graminis*] was shown by Ackermann BJM 34, which can further be relied upon for high yields and is recommended for large-scale cultivation. Also

resistant were Kenia (Standard), and the following descendants of the German Weihenstephaner mildew-resistant barleys: Ackermann BJM 33, J16/151, Ackermann Do.M 172 (Donaria II), Ackermann J16/265 (Isaria II = Nova), Heines Pirol, and Firlbecks Sommergerste III.

In tests to determine the reactions of six Sudan grass and two sorghum varieties to leaf spot (*Helminthosporium turcicum*), Piper and Tift Sudan grass were the most resistant while Italian and California 23 were very susceptible.

The average incidence of beet yellows virus was under 10 per cent. The first aphid vectors of the disease were detected in the fields towards the end of May, and by the end of June the population of *Aphis fabae* was fairly heavy in contrast to the scarcity of *M. persicae* referred to above.

Sibilia (C.). **Rassegna dei casi fitopatologici più notevoli osservati nel 1954.** [Review of the most noteworthy phytopathological records observed in 1954.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 233–251, 1956.

This report from Italy [cf. 35, p. 508] contains, among others, the following items of information. Premature defoliation of olive trees caused by *Cycloconium oleaginum* [35, p. 531] was prevalent, and in some places damaging. 'Leprosy' (*Gloeosporium olivarum*) [35, p. 834] appears to be spreading near Bari and Brindisi and has appeared in Calabria and Sicily. *Polystigma ochraceum* [cf. 15, p. 683] was found on the branches and *Clasterosporium carpophilum* [35, p. 531] on the leaves and twigs of almond received from Bari. Fig leaves from Rome were infected by *Gloeosporium elasticae* [*Glomerella cingulata* var. *minor*: cf. 29, p. 157]. Potatoes, both imported and Italian-produced, were widely affected by *Rhizoctonia violacea* and *R. crocorum* [*Helicobasidum purpureum*: map 275].

Mijušković (M.). **Prilog poznavanju parazitne flore u N R Crnoj Gori.** [A contribution to the knowledge of the parasitic flora in P.R. of Montenegro.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1956*, 34, pp. 73–78, 1956. [French summary.]

This second list (cf. *Plant Prot., Beograd*, 1, 1950) [cf. 35, p. 91 and next abstract] of plant diseases recorded in Montenegro, Yugoslavia, during the period 1950 and 1955 includes the following: *Botrytis allii* on onion [map 169], *Colletotrichum gloeosporioides* [*Glomerella cingulata*], rather severe on orange and lemon trees in 1950 and 1952, *C. lindemuthianum* on bean (*Phaseolus vulgaris*) [map 177], *Microsphaera quercina* widespread on oak and particularly severe in 1955, *Mycosphaerella fragariae* on strawberry [map 110], *Nectria galligena* on beech [map 38], *Plowrightia ribesia* on red currant [map 180], *Puccinia chrysanthemi* on chrysanthemum [map 117], *Sphaceloma rosarum* [32, p. 628], serious in 1955, and *Sphaerotheca pannosa* var. *rosae*, severe every season, on rose, and *Uromyces lupinicola* on lupin, first observed in 1950 and sometimes reducing the foliage by a third.

Tanić (B.). **Prilog poznavanju parazitne mikoflore Bosanske Krajine.** [A contribution to the knowledge of the parasitic mycoflora of Bosanska Krajina.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1956*, 34, pp. 79–85, 1956. [English summary.]

Of the 103 diseases recorded in Bosanska Krajina, Yugoslavia [cf. 34, p. 516 and preceding abstract], during the disease survey carried out in 1954 to 1955, the following were reported by the Agricultural Institute in Banja Luka to be serious and causing heavy losses: *Puccinia graminis* on wheat, oats, *Lolium perenne*, *L. italicum*, *Poa pratensis*, and *Phleum pratense*; *Helminthosporium turcicum* on maize [29, p. 56]; *Gnomonia leptostyla* on walnut [31, p. 353]; *Phytophthora infestans* on potato [34, p. 705] and tomato; *Venturia inaequalis* on apple [35, p. 375]; *V. pirina* on pear [34, p. 728]; and *Septoria tritici* on wheat [34, p. 516]. Included among other records of interest were *Cronartium ribicola* on black currant [map 6] and *Puccinia dispersa* on rye [map 226].

Jamalainen (E. A.). **The Plant Pathology Department of the Agricultural Research Centre. The most important diseases of crop plants in Finland and their control.** —*Maatalousk. kasvitautiosast. Tiedon.* 18, 15 pp., 13 figs., 1956. [Photo-offset.]

Much of the information in this report on current activities at the Agricultural Research Centre, Tikkurila, Finland [cf. 32, p. 471], has already been noticed from other sources. Very good control of snow mould (*Fusarium nivale*) [*Calonectria nivalis*] on winter cereals and of fungi in winter turnip rape, e.g., *Typhula* spp. and *Sclerotinia sclerotiorum* [33, p. 744], was obtained by seed treatment in the autumn with PCNB (pentachloronitrobenzene) [cf. 34, p. 790].

There are difficulties in controlling a number of vegetable diseases in the field and store, including tomato leaf mould (*Cladosporium fulvum*) and streak [virus: strain of tobacco mosaic virus] and club root of crucifers (*Plasmodiophora brassicae*). In experiments with the last-named the treatment of planting holes with calomel [mercurous chloride: cf. 35, p. 255] gave promising results. Onion storage is complicated by a tendency to the development of neck rot (*Botrytis allii*) [map 169].

PCNB has also proved effective against the damage caused by *Herpotrichia nigra* to overwintering conifer seedlings in nurseries [cf. 34, p. 328].

Brown rust of wheat (*Puccinia triticina*) is regarded as the most important cereal rust in Finland and *Tilletia caries* as the most important smut. About one-third of all cereal seed is treated annually with organic mercurials [32, p. 239].

Powdery scab (*Spongospora* [*subterranea*]) [map 34] is recorded among other diseases on potatoes.

Apple yields may be reduced by internal cork due to boron deficiency [cf. 29, p. 468], while bitter rot (*Gloeosporium* spp.) [*Glomerella cingulata*] is responsible for heavy damage to stored fruits. Other fruit diseases include pocket plums (*Taphrina pruni*) and plum and cherry shot hole [*Pseudomonas mors-prunorum*: map 132].

Deighton (F. C.). **Diseases of cultivated and other economic plants in Sierra Leone.** —76 pp., Government of Sierra Leone, 1956. 5*s*.

This comprehensive publication [cf. 24, p. 26], primarily for the use of Agricultural Officers in Sierra Leone, will be of value in neighbouring areas of West Africa and of general interest to plant pathologists in tropical Africa. Following an introductory chapter host plants are dealt with under cereals, plantation crops and fruit trees, other agricultural crops including cover crops and vegetables, forest and shade trees, fodder grasses, and ornamental plants. In addition to diseases of economic account, in connexion with which control measures are indicated, other fungi recorded on these hosts and various minor diseases and disorders are noted. Attention is also drawn to certain diseases not yet recorded in the colony though occurring in neighbouring areas and elsewhere, such as swollen shoot virus of cacao, leaf spot (*Mycosphaerella musicola*) of banana, and maize smut (*Ustilago maydis*).

Cohen (G.). **Outbreaks and new records. Israel.**—*F.A.O. Pl. Prot. Bull.*, 3, 6, pp. 93–94, 1955.

In these notes on plant diseases observed in Israel between May and December, 1954 [cf. 32, p. 424], it is recorded that apple root rot (*Sclerotium rolfsii*), formerly prevalent mainly in the coastal plain, has spread northwards. Bitter rot (*Glomerella cingulata*) occurred in a limited area, but damage was reduced to a minimum by spraying with phygon and zineb. Control of powdery mildew (*Podosphaera leucotricha*) [15, p. 683] was difficult to achieve, because of the high temperatures that prevailed during summer, sulphur sprays in such conditions causing burning of leaves and fruit. Plum rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) [26, p. 113] appeared early in the season, mainly on Santa Rosa; spraying with 15 per cent.

zineb gave satisfactory control. Brown rot (*Sclerotinia laxa*) was observed for the first time in one locality in the hilly part of Judaea, causing a wilt of the blossoms and young twigs of Wickson plums and apricots. A heavy outbreak of *Pseudomonas solanacearum* [map 138] caused considerable losses in seed potato production. Severe losses of barley were sustained, owing to attacks by net blotch (*Pyrenophora teres*) and stripe (*Helminthosporium gramineum*) [34, p. 520].

MILLER (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 3, 7, pp. 104–107, 4 figs., 1955.

Sweet clover (*Melilotus alba*), used locally for green manure, is also a common roadside weed in most agricultural areas of Idaho, and bean yellow mosaic virus [34, p. 272] is prevalent on it even in areas remote from cultivated fields of the crop. Among the bean [*Phaseolus vulgaris*] varieties tested in the greenhouse for resistance to the type strain of the virus, Montana Great Northern Number 1 and Number 43–15, reported to possess some resistance, proved as susceptible as University of Idaho Great Northern Number 123 and Number 59 [cf. 33, p. 8], all becoming 100 per cent. infected and developing equally severe symptoms.

A stem-gall disease of Cimarron castor bean (*Ricinus communis*), observed in a commercial nursery at Cameron, Texas, was caused by an organism tentatively identified as a species of *Synchytrium*.

Thirty-sixth Annual Report, Department of Agriculture, California, for the period ending 31 December, 1955. Bureaux of Plant Pathology and Plant Quarantine. —*Bull. Dep. Agric. Calif.*, 45, 2, pp. 171–187; 188–198, 4 figs., 1956.

G. L. STOUT and G. E. ALTSTATT present the report of the Bureau of Plant Pathology [cf. 35, p. 285] in which G. E. ALTSTATT, C. W. NICHOLS, and T. R. CARPENTER deal with permanent surveys for, *inter alia*, European canker of apple (*Nectria galligena*), cherry buckskin disease [peach western X-disease virus], other virus diseases of cherry, a virus-like disease of sweet potato, and chestnut blight (*Endothia parasitica*). *N. galligena* caused severe damage in an apple orchard in Sonoma county. First recorded in California in 1909, it is known to occur on apple in the counties of Del Norte, Humboldt, Marin, and Sonoma, where it has not hitherto been serious. A survey for the presence of peach western-X disease virus, covering 13 counties, revealed infected trees on six out of 87 properties in Placer county and two out of 26 in Sutter county, the first report of the disease for these counties.

Rugose mosaic [virus] was present on cherry in 22 properties in Placer county, where it has not previously been recorded. Symptoms of cherry mild rusty mottle [virus] disease [cf. 26, p. 248] were seen in six counties; necrotic rusty mottle [virus] was observed in nine counties; and cherry [necrotic] ring spot [35, p. 286] and cherry crinkle (a disorder with virus-like symptoms) were quite general in all cherry inspections.

A disease of the sweet potato, apparently due to a virus, was reported in San Bernardino county in October, 1954, and subsequently in ten other counties. Symptoms included extreme dwarfing, with leaf malformation; a light dull green coloration of the foliage, the younger leaves exhibiting a transitory mottle or mosaic; and small fleshy roots, few in number, with reduced fibrous roots. Plant to plant spread was not observed in the field.

For the second consecutive year no cases of *Endothia parasitica* on chestnut were found.

R. L. MCCLAIN reports on a search for peach mosaic in six southern counties, where 1,064 affected trees were found on 330 properties, but only two were outside the present quarantined area. Peach mosaic was not encountered north of the Tehachapi mountains.

R. L. McClain also reports that a search for tristeza [virus] (quick decline) infection of citrus in the regulated zone (little or no infection) revealed infection only in the west of Ventura county. In the lightly infected part of the quarantined area there was a decided increase of infection, and in the heavily infected part continued rapid spread was noted, particularly in the west of San Bernardino county and the north of Orange county. The present quarantined area embraces about 74 per cent. of the total orange acreage of the State, 98 per cent. of all infections being estimated to have occurred in the area defined as heavily infected. The total of all trees which have ever been affected amounts to less than 4 per cent. of all trees in the State.

A. Schlocker reports that yellow leaf roll of peach is at present restricted to the counties of Butt, Placer, Sutter, and Yuba. Inspections revealed an increase of 40 cases over the previous year, mainly due to one outbreak in Sutter county. There were 13 newly infected properties, the lowest figure since inspection began. In a survey of western X-disease of peach 426 infected trees were found on 172 properties, 352 on 155 being new cases, of which 66 properties (122 cases) had no previous history of the disease.

A. Schlocker and R. L. McClain carried out inspections for peach yellow bud mosaic in 11 counties, finding 185 new cases on 36 properties in five of them. Napa county was added to the affected list, with five infected trees on two properties. In Placer county there were six cases on two properties and in El Dorado 25 cases on five with no previous record of the disease.

In the report of the Bureau of Plant Quarantine A. P. Messenger and E. A. Breech record from a number of Easter lily plantings in the counties of Humboldt and Del Norte a disease believed to be fleck [29, p. 563], a serious virus infection hitherto seldom seen in this area.

Leyendecker (P. J.) & Nakayama (R. M.). **1955 plant disease summary for New Mexico.**—*Plant Dis. Reptr*, 40, 2, pp. 159–161, 1956.

The following diseases were of special interest in 1955 in New Mexico [cf. 29, p. 407]. Scab (*Streptomyces* [*Actinomyces*] *scabies*), not previously recorded on radish [cf. 32, p. 358] in the State, caused complete loss in a ten-acre field of Scarlet Globe where no root crop had been grown before. Tomato big bud virus affected commercial plantings of tomatoes and bell and chilli peppers and is increasing in severity throughout the State. Most tomato fields had 1 to 2 per cent. infection, the fruit on affected plants being irregularly shaped and unevenly coloured.

Chilli pepper mosaic virus [cf. 35, p. 348] was very severe in the north. A combination of cucumber [mosaic] virus [35, p. 510] and what appeared to be a calico virus was noticed in some fields, and a virus disease, apparently [tomato] spotted wilt [map 8], was observed for the first time in New Mexico in most chilli-growing areas.

Apple powdery mildew (*Podosphaera leucotricha*) [35, p. 24], appearing for the first time for several years in the north, seriously reduced terminal growth in some orchards.

Aster yellows virus on lettuce [34, p. 807], another new record for New Mexico, occurred in the Mesilla Valley on numerous autumn plantings of Great Lakes.

Anthracnose (*Colletotrichum* spp.) of broom corn [*Sorghum bicolor* var. *technicus*] was recorded in the Clovis area, causing premature head ripening which seriously reduced yields.

Hemmi (T.). **Notes on new or noteworthy plant diseases in Japan—I.**—Reprinted from the Jubilee publication in commemoration of the sixtieth birthdays of Prof. Tochinai and Prof. Fukushi, pp. 1–5, 1955. [Japanese summary.]

An anthracnose of dahlias in the Kinki district, Kyoto, Japan, caused by *Gloeo-*

sporium (*Colletotrichum*) *dahliae* n.sp. appears on the stems as brown or greyish spots which elongate, finally having a white centre and dark brown border. The acervuli are 78 to 260 μ in diameter and the conidiophores 11 to 24 by 3 to 4 μ; five or six setae arising in the acervulus are 1- to 3-septate and 34 to 70 by 2·6 to 4·4 μ. The conidia are mostly straight, sometimes curved or irregularly shaped, 9·8 to 22 by 3 to 6·1 μ. The presence of setae distinguishes the pathogen from *G. mollerianum*.

A die back or stem anthracnose of cowpea caused by *Colletotrichum truncatum* [cf. 14, p. 416; 33, p. 63] was responsible for considerable damage in 1952 near Kyoto and Osaka. The disease had not previously been recorded in Japan, nor had cabbage yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*: map 54], which was reported in 1952 by the Aichi Horticultural Experiment Station.

Owen (H.). **Further observations on the pathogenicity of Calonectria rigidiuscula (Berk. & Br.) Sacc. to Theobroma cacao L.**—*Ann. appl. Biol.*, 44, 2, pp. 307–321, 1 fig., 1956.

In an investigation conducted at the West African Cacao Research Institute, Gold Coast, into the association of *Calonectria rigidiuscula* with cacao die-back and injury caused to cacao by the mirids *Sahlbergella singularis* and *Distantiella theobroma* in West Africa [26, p. 537; 35, p. 429], many infected mirid lesions and other kinds of damage were sampled to secure quantitative data on the incidence of *C. rigidiuscula*, *Botryodiplodia theobromae*, and other fungi. Observations on the rates of spread of these fungi in the xylem of cacao plants and allied species indicated that mirid lesions particularly favour the development of *C. rigidiuscula*. The fungus also occurs as a saprophyte on cacao pods, which may be an important source of infection, and as a wound parasite in woody plants other than cacao.

Inoculation tests with Amelonado and Trinitario clones gave evidence of some variation in susceptibility, and there were indications that certain types of Upper Amazon cacao may, perhaps, be resistant. Most cases of cacao die-back induced by fungi originate in open mirid lesions, many of which, even though they heal and become occluded, retain viable fungus. Only a minority of these are infected by *C. rigidiuscula*; the next most prevalent fungus is *B. theobromae*, others being unimportant.

C. rigidiuscula may prove to be a widespread and important pathogen of cacao; it was also isolated from material from Sierra Leone and the British Cameroons, presumably occurring throughout West Africa. Attempts to reduce the damage by control of the mirids is one possiblity, as control of the fungus with its wide host range and saprophytic habit would be very difficult, but more effective would be the finding of resistant varieties.

Rieuf (P.). **Les principales maladies des céréales au Maroc.** [The principal diseases of cereals in Morocco.]—*Mem. Serv. Def. Vég., Maroc*, 62, 47 pp., 1954.

This pamphlet lists the most important diseases of cereals in Morocco, a brief description being given of each, followed by a note on control measures. Pathogens recorded include *Urocystis tritici* on wheat [map 80], *Gibberella fujikuroi* on maize and rice [map 102], and *Piricularia oryzae* on rice [map 51].

Leben (C.), Scott (R. W.), & Arny (D. C.). **On the nature of the mechanism of the water-soak method for controlling diseases incited by certain seed-borne pathogens.**—*Phytopathology*, 46, 5, pp. 273–277, 1956.

At the Wisconsin Agricultural Experiment Station filtrates from seed of Oderbrucker, Kindred, and Moore barley, Henry wheat, and Vicland oats soaked in water for 56 hours at 26° C. [cf. 33, p. 78 and next abstract] were found to contain

volatile acids which were identified by paper and column chromatography as formic, acetic, and butyric. The only non-volatile acid detected was succinic.

In studies to determine the mechanism of fungal control by this method, spore germination of *Helminthosporium victoriae* from oats and *Ustilago nuda* from barley was inhibited by soaking in water under anaerobic conditions (in nitrogen), and in *U. nuda* also by steam distillates from barley and oat filtrates and by a solution of the above-mentioned acids together at various pH levels, the strongest effect being exerted at pH 4 and 5.

It appears from these results that the anti-fungal activity of the immersion treatment is linked with the fermentation process, anaerobiosis being one of the leading factors. The acids produced may also be inhibitory.

Arny (D. C.) & Leben (C.). **Control of several small grain diseases by the water-soak seed treatment.**—*Phytopathology*, 46, 6, pp. 344–345, 1956.

In studies on the applicability of the water-soak method of seed treatment to cereal diseases [cf. 34, p. 144 and preceding abstract] at the Wisconsin Agricultural Experiment Station, attention was directed principally to the seedling blights (*Helminthosporium victoriae* and *H. sativum* [*Cochliobolus sativus*]) of oats (variety Vicland, C.I. 3611) and barley (Wisconsin Barbless, C.I. 5105), and stripe (*H. gramineum*) of barley (Atlas, C.I. 4118). The seed was immersed for 56 hours in distilled water at 24° to 26° C., 20 gm. per ml. being generally used. After drying at room temperature sowings were made in soil in the greenhouse for germination and disease determination. Comparative treatments with ceresan M [see below, p. 19] were also made.

Water-soaking caused slight decreases in germination. It reduced the percentage of *H. victoriae* from 41 to 6, of *C. sativus* from 54 to 11, and of *H. gramineum* from 7 to 6, the corresponding figures for ceresan M being 3, 5, and 0.

Soaked and untreated lots of surface-sterilized barley seed were plated on a malt extract (2 per cent.)-sodium chloride (7·5) agar medium. The percentage of *Alternaria* spp. developing was reduced from 50 to 1 per cent. by the treatment, while decreases were also observed in the growth of the less prevalent *Fusarium* and *Helminthosporium* spp. and moulds (*Aspergillus* and *Penicillium* spp.). In similar tests with Atlas barley *H. gramineum* was detected on 55 per cent. of the untreated and on none of the soaked seeds. The percentage of bacteria was, however, increased markedly by the treatment.

Kommedahl (T.) & Young (H. C.). **Effect of host and soil substrate on the persistence of Fusarium and Rhizoctonia in soil.**—*Plant Dis. Reptr*, 40, 1, pp. 28–29, 1956.

Greenhouse experiments (70° F. day and 60° night) at Ohio Agricultural Experiment Station, Wooster, revealed that two successive croppings of C54 maize, Clinton 59 oats, or Thorne winter wheat in fresh soil, the second six weeks after the first, increased the percentage of seedlings infected by *Fusarium*, as determined by plate counts, from one to 44, 30 to 78, and 15 to 48 per cent., respectively, but significantly decreased the number of wheat seedlings infected by *Rhizoctonia* [*Corticium*] *solani*. The incorporation in untreated soil of maize stalks infected by *Gibberella zeae* and *Fusarium* spp. (with or without 20 lb. ammonium sulphate per ton of stalks) had an effect on the pathogenic flora of Thorne wheat seedlings similar to the above [cf. 32, p. 277].

Sibilia (C.). **Incidence of stripe rust of Wheat in central Italy in 1954.**—*F.A.O. Pl. Prot. Bull.*, 3, 9, p. 139, 1955.

In central Italy wheat stripe rust (*Puccinia glumarum*) [25, p. 492; 34, p. 439]

usually appears between the middle of March and the first ten days of April, epidemics usually ending in May. In 1954, however, owing to abnormal climatic conditions, the appearance of the disease was delayed until 28th April in the Rome area, and until 27th May at Ancona. Incidence was light. Owing to the mild spring temperatures, the period suitable for the multiplication and spread of inoculum was also prolonged. The first teleutospores (usually produced in May, before the outbreak of *P. graminis*) were recorded on 7th June at Viterbo and on the 16th at Rieti, while uredospore production was still continuing.

Sibilia (C.). **Rapporti fra Puccinia rubigo-vera agropyri e cereali coltivati.** [The relations between *Puccinia rubigo-vera agropyri* and cultivated cereals.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 133–135, 1956. [English summary.]

Inoculations with aecidiospores of *Puccinia rubigo-vera agropyri* [*P. triticina*: cf. 14, p. 746; 35, p. 819] obtained from wild *Clematis vitalba* in Italy were completely positive on wheat, giving type 4 infection. On barley only a few small pustules surrounded by a necrotic halo developed; on rye none formed, though a few spots appeared, induced by hypersensitivity. Oats gave no reaction. These results appear to differ from those reported by various other workers [cf. 26, p. 239; 33, p. 383] and further investigations are in progress.

Basile (Rita). **Alcune razze fisiologiche di Puccinia graminis-tritici Erikss. et Henn. della Grecia.** [Some physiologic races of *Puccinia graminis-tritici* Erikss. & Henn from Greece.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 137–140, 1956. [English summary.]

In July, 1955, the author identified three physiologic races of *Puccinia graminis* on wheat harvested at the Institute for the Improvement of Plants, Salonika, on 10th June, 1955. They were race 34, a new race, N, and one tentatively identified as race 16. Race N is a weak pathogen with infection indices mostly about 1, except on Arnautka and Khapli wheats, on which they are about 3 = ; on the highly susceptible Little Club the rating is 1++. The other physiologic races present in Greece are 14, 21, 40, and 75 [cf. 17, p. 225].

Ponchet (J.). **Évolution et spécialisation du Puccinia graminis tritici Eriks. et Henn. en France au cours de la période 1952–1954.** [The development and specialization of *Puccinia graminis tritici* Eriks. & Henn. in France during the period 1952–1954.]—*Ann. Inst. Rech. agron.* Sér. C (*Ann. Épiphyt.*), 7, 2, pp. 229–251, 3 graphs, 10 maps, 1956.

Three years' studies at the Central Station of Plant Pathology, Versailles, France, on the development of resistance in wheat to *Puccinia graminis* [cf. 35, p. 754, *et passim*] are described. Relatively few races are concerned in the annual epidemic outbreaks of the rust, and most, except race 40 [loc. cit.], are only of average virulence. All varieties of wheat grown in France are susceptible. The few foci of infection that appear every year as a result of the presence of barberry remain localized. The wide distribution of the races most frequently found results from the rapid spread of the rust. These very prevalent races are clones which multiply vegetatively in the uredospore stage; they probably come from some region remote from France [see next abstract]. They are widely present in countries bordering on the Mediterranean and in central Europe.

There is thus a population of physiologic races which extends over these countries every year and may be regarded as a single entity, differing from the populations found in other parts of the world; information concerning it should be carefully collated.

İREN (S.). **Orta Anadolu hububat bölgesinde kara pas — Puccinia graminis tritici — mantarının önemi, epidemi haline geçme imkânları, ırkları, mukavim çeşitler yetiştirmede ırkların rolü ve ara bitkileri üzerinde araştırmalar.** [Studies on the black stem rust of Wheat—*Puccinia graminis tritici*—in the central Wheat-growing area, its importance, predisposing factors of an epidemic, its races, importance of the racial studies in the breeding of resistant varieties, and the alternate host.]—*Zir. Vekâl. Mücad. Enstit. Müdür.*, *1955*, 101 pp., 38 figs., 1955. [English summary.]

Black rust of wheat (*Puccinia graminis tritici*) is stated to be destructive in most of the provinces of the central plateau of Turkey [27, p. 114] and, because it appears later than yellow rust (*P. glumarum*) [loc. cit.], its importance has been rather overlooked. Varieties bred for resistance to yellow rust alone are, therefore, useless. A general epidemic occurs in the central wheat-growing areas only when adequate rainfall in May and June is associated with the arrival of wind-borne uredospores from the south and west. Of the foreign varieties tested in 1953, Einkorn, Vernal, and Khapli were highly resistant and Reliance, Thatcher, and Lee moderately so to race 21 of *P. graminis*. The Turkish Melez B/a was also moderately resistant.

Wild grasses are of no consequence as sources of infection or as alternate hosts in the central plateau, but may be of importance in the western and southern coastal areas where the rust can overwinter in the uredo stage.

Overdoses of ammonium sulphate should be avoided, especially during epidemics; sowing at subnormal rates is not recommended as a control measure. Incidence was not increased by infection with loose or covered smuts (*Ustilago tritici* and *Tilletia foetida*) [27, p. 115] or *Septoria* leaf spot (*S. tritici*) [27, p. 349]. Races 14, 17, 19, 21, and 24 of *P. graminis*, identified from 17 collections in the central plateau in 1952 and 1953, were also recorded in the western and southern neighbouring countries, thus confirming the view that uredospores spread from these areas.

Berberis crataegina, the only species widespread in the central plateau, *B. cretica*, *B. vulgaris*, *B. densiflora*, and *B. orientalis* are all alternate hosts of *P. graminis* in Turkey.

AKAI (S.). **On the resistance of urediospores of Puccinia triticina to low temperature.** —*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 15–17, 1954. [Japanese, with English summary.]

Uredospores of *Puccinia triticina* collected from naturally infected wheat plants in Japan in May were stored dry at —10° C. The germination percentage declined rapidly after one day's storage and was nil after 60 days. Spores in water suspensions had a lower resistance to cold at —10° than those kept dry. Resistance to low temperature was increased when affected leaves were incubated at —4° and the spores suspended in water and subsequently stored at —10°.

NAKAGAWA (K.) & KUMADA (S.). **Some considerations on the outbreak of cereal stripe rust, Puccinia glumarum E. et H., in Fukushima Prefecture.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 45–52, 1 diag., 1 graph, 1954. [Japanese, with English summary.]

The epidemic occurrence of *Puccinia glumarum* [30, p. 620] on cereal crops in Shirakawa district, Fukushima Prefecture, Japan, is ascribed to delayed growth in cold weather during May and June, the delay of the appearance of leaf rust [*P. triticina*] to compete with *P. glumarum*, proximity to areas where the disease appears earlier with a prevailing wind blowing from these regions, and the cultivation of susceptible varieties.

Villanueva Novoa (R.). **Herencia de la reacción a 'Oidium', roya de la hoja, roya del tallo, y de otros caracteres, en el cruce de los Trigos 'María Escobar' e 'Industrial Argentino'.** [Inheritance in reaction to '*Oidium*', leaf rust, stem rust, and other characters in the cross between the Wheats 'María Escobar' and 'Industrial Argentino'.]—*Bol. Estac. exp. agríc. La Molina* 59, 30 pp., 98 figs., 1955.

The author reports breeding experiments at the La Molina Agricultural Experiment Station, Lima, Peru, from 1951 onwards for resistance to *Erysiphe graminis*, *Puccinia rubigo-vera tritici* [*P. triticina*], and *P. graminis* in wheat [cf. 34, p. 217]. One parent, Maria Escobar, was susceptible to *E. graminis*, resistant to *P. triticina*, and susceptible to *P. graminis* while the other, Industrial Argentino, was resistant to *E. graminis*, susceptible to *P. triticina*, and moderately resistant to *P. graminis*. In the F_2 generation of 1,073 plants the numbers susceptible and resistant to the three diseases, respectively, were 449:624, 678:395, 927:146. There seemed to be a linkage between a dwarfing character from Industrial Argentino and reaction to stem and leaf rust.

Rowell (J. B.) & Hayden (E. B.). **Mineral oils as carriers of urediospores of the stem rust fungus for inoculating field-grown Wheat.**—*Phytopathology*, 46, 5, pp. 267–268, 1956.

In four tests at the Minnesota Agricultural Experiment Station during the growing season of 1955, two mineral oils, viz., light petrolatum U.S.P. and a 1:1 mixture of the same plus S/V Sovaspray 100 (an isoparaffinic, low-viscosity spray oil product of Socony-Vacuum Oil Co., Inc.) proved to be efficient carriers of uredospores of *Puccinia graminis* (race 15 B) [35, p. 818] for the inoculation of wheat in the field. Heavy infections resulted from inoculation with uredospores carried in mineral oil, distilled water, 1 per cent. aqueous tween 20 [32, p. 273], or talc, followed by incubation under polyethylene tents. The inoculum suspended in the liquid carriers was applied by means of a glass atomizer at 15 lb. per sq. in. pressure from a portable air-compressor, while a cyclone-type hand duster [30, p. 460] was used for the uniform mixture of spores and talc. Under natural conditions of incubation, however, much higher percentages of rust developed on plants inoculated with spores carried in mineral oil (up to 38 per cent.) than in water (3) or talc (6). It is postulated that the mineral oils enhance the resistance of the spores to washing and weathering.

Athwal (D. S.) & Watson (I. A.). **Resistance to Puccinia graminis tritici in Khapstein, a vulgare derivative of Khapli emmer.**—*Proc. Linn. Soc. N.S.W.*, 81, 1, pp. 71–77, 1956.

In further breeding studies at the University of Sydney [cf. 34, p. 218] the resistance of the variety Khapstein (from Steinwedel × Khapli) to two Australian races of *Puccinia graminis* (126 Anz 1 and two biotypes of 222) [see next abstract] and to the Indian race 21 was shown to be dependent on a dominant and a recessive factor, independently inherited. Each confers partial resistance when present singly, and together the effect is additive. In crosses of Khapstein with other resistant varieties these two factors were not allelic with a group of genes for resistance to race 222 AB in Marquillo, Thatcher, and Hochzucht, nor with a factor for resistance to this race present in Kenya 744 and Kenya 117 A, nor with the factor for immunity from race 21 in Thatcher and Hochzucht.

Pugsley (A. T.). **The gene Sr Ka 1 in relation to the resistance of Wheat to Puccinia graminis tritici.**—*Emp. J. exp. Agric.*, 24, 95, pp. 178–184, 1956.

Genetical analyses of a number of wheat varieties, using two Australian races of *Puccinia graminis*, were initiated at the Waite Agricultural Research Institute,

South Australia, in 1952, and continued at Wagga, New South Wales, during 1954 and 1955 [35, p. 362 and preceding abstract]. The behaviour of many of the test varieties was governed by a single gene common to those varieties, designated Sr Ka 1 [34, p. 219], which was effective against races 126 Anz 1 and 222 Anz 2 as well as the North American race 15 B. This gene did not confer resistance to 126 Anz 2 nor to the North American race 49. The protective action of Sr Ka 1 decreased when plants were kept at a high temperature.

The confusion existing in the naming of resistant varieties is pointed out; different ones may be listed under a common name or genetically similar varieties may receive a number of designations. The setting up of an international centre for maintaining authentic material is advocated.

Muraviov (V. P.) & Shlyapak (S. I.). **Increase of the resistance of Wheat against wet smut by the influence of nutrients.**—*Visn. Akad. Nauk Ukr. R.S.R.*, 25, 10, pp. 29–36, 1954. [Abs. in *Agric. Lit. Boron* 31, p. 23, 1955.]

Cultivation [in the U.S.S.R.] of the winter wheat varieties Ukrainka and Lutescens 17 over three years with applications of the minor elements boron, copper, magnesium, and manganese, and complete fertilizer gave increased resistance to bunt [*Tilletia caries*], especially in Ukrainka, which responded particularly to boron, zinc, and manganese. The yield was also increased.

Servazzi (O.) & Prota (U.). **Chiarimento ad una nota dal titolo : Nuove prove di orientamento nella lotta contro la 'carie' del Frumento condotte in Sardegna nel 1953–54 con prodotti acuprici polverulenti.** [Clarification of a note entitled: New exploratory experiments in the control of 'bunt' of Wheat carried out in Sardinia in 1953–54 with acupric dust products.]—*Notiz. Malatt. Piante, 1956*, 34 (N.S. 13), pp. 41–42, 1956.

Attention is drawn to the fact that in Prota's recent paper on the control of wheat bunt [*Tilletia caries* and *T. foetida*: 35, p. 94] the statement that pentagran contained sodium pentachlorophenate was made in error, owing to a wrong label. Pentagran, in fact, contains pentachloronitrobenzene.

Grasso (V.). **Ricerche preliminari sulla genetica di una collezione di carie del Grano, proveniente da Noto (Siracusa).** [Preliminary researches on the genetics of a collection of cereal bunt from Noto (Syracuse).]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 217–227, 2 figs., 1956. [English summary.]

During a visit in 1952–3 to the Institute of Plant Pathology, Pullman, Washington, the author's attention was drawn to a collection of wheat bunt from Noto, Syracuse, Sicily, which might possibly have been assigned to *Tilletia brevifaciens* [*T. controversa*: 35, p. 667], but the markings on the chlamydospores were echinulate, irregular, and often cerebriform. Wheat seeds inoculated with this material were sown in the field and the infection produced on the plants appeared to be not of *T. controversa*, but probably *T. caries*.

In 1955 the author returned to Pullman and proceeded to germinate the chlamydospores of the Noto collection (1) and of Italian collections of *T. foetida* (2) and *T. tritici* [*T. caries*] (3), both from Macerata, *T. controversa* from Parma (4) and Piacenza (5), and *T. triticoides* from Syracuse (6) and Vicenza (7). In agarized water at 15° C. collections 2, 3, 6, and 7 germinated, on an average, after about one week, while 1, 4, and 5 required longer. At 5° 4 and 5 failed to germinate regularly, while the remainder did so after 15 to 22 days. The basidiospores were transferred individually to pieces of agar and thence each to a Van Tieghem cell kept at 15°. After each basidiosporal line had produced a colony, pairing was effected. If fusion occurred the two cells were joined by an isthmus-like formation. The results obtained indicated that two sexual groups were present in the Noto collection. The study is being continued.

Kobel (F.). **Die Verbreitung des Zwergbrandes und die Möglichkeiten seiner Bekämpfung.** [The spread of dwarf bunt and possibilities of its control.]—*Schweiz. landw. Mh.*, 34, 2, pp. 134–136, 1956.

Useful information is presented in semi-popular terms on the symptoms of wheat dwarf bunt [*Tilletia controversa*], its physiology, spore dissemination, present distribution in Switzerland [35, pp. 91, 597], where its incidence may reach 100 per cent., detection of centres of infection, control by chemicals, and (as a long-term project already initiated at the Agricultural Research Institute, Zürich-Oerlikon [cf. above, p. 5]) the breeding of resistant varieties.

Johnston (C. O.) & Reitz (L. P.). **Reaction of varieties and selections of hard red winter Wheat to bunt in uniform bunt nurseries (1948–1954).**—[*Mimeogr. Publ.*] *Pl. Industr. Sta.*, 13 pp., 1955.

Continuance of these investigations in the United States [31, p. 58; cf. 35, p. 756] showed that many of the hard red winter wheat selections from crosses involving Oro-Turkey-Florence, Hussar × Hohenheimer, and C.I. 12250, and from Yogo × Wasatch, Turkey × Oro, and Yogo × Rescue were highly resistant to common bunt (inoculum of *Tilletia foetida* used at most stations; *T. foetida* and *T. caries* at Bozeman, Montana) and resistant to dwarf bunt [*T. controversa*] in infested soil at Spring Hill, Montana. A selection of Marquillo-Oro × Oro-Turkey-Florence has been bulked in Kansas and is being held in reserve should *T. controversa* appear there.

Pomeranz (Y.), Halton (P.), & Peers (F. G.). **The effects on flour dough and bread quality of molds grown in Wheat and those added to flour in the form of specific cultures.**—*Cereal Chem.*, 33, 3, pp. 157–169, 1956.

At the Cereals Research Station, St. Albans, England, the increase in mould population consequent on storing wheat at high moisture-levels (18·5 and 23·5 per cent.) and temperature (20° to 21° C.) resulted in a fall in test weight and fat content and an increase in fat acidity [cf. 35, p. 818]. The pre-storage fungus population of 1,000 colonies per gm. rose to 6,700,000 in eight weeks at 18·5 humidity and to 4,900,000 after a month at 23·5. There was a decrease in thiamine and a smaller one in nicotinic acid, whereas riboflavin increased. The flour yield rose, partly on account of greater bran fracture. The colour of the flour deteriorated and its ash content was increased. Small additions of mouldy flour were found to improve the baking quality of sound material.

The addition to flour of cultures of *Aspergillus flavus* and *A. ochraceus* caused a marked deterioration in water absorption, dough properties, and bread quality. The effects of *A. candidus* and *A. amstelodami* were less harmful, and those of *Penicillium chrysogenum* negligible. *A. niger* was responsible for a heavy drop in water absorption and adversely affected dough characteristics in some respects, but it improved the quality of the bread. *Alternaria tenuis* caused a slight fall in water absorption but exerted a favourable influence on the stretching property of dough similar to that exerted by oxidation.

The effect of moulds on dough and bread quality is partially explicable by a balance between improvement due to increased amylase activity and the falling-off resultant on strong proteolysis, but it is postulated that other active substances may be elaborated during the growth of the organisms on bran mash.

Schmidt (J. W.), Webster (H. S.), & Fellows (H.). **Range of reactions to Wheat streak-mosaic virus in hybrids derived from Triticum vulgare × Agropyron elongatum.**—*Agron. J.*, 48, 8, pp. 371–373, 3 figs., 1956.

At Kansas Agricultural Experiment Station, Manhattan, Agrotricum (*Agropyron* × *Triticum*) hybrids were tested for their reaction to inoculation with wheat streak

mosaic virus [35, pp. 439, 819, and next abstract] by carborundum leaf-wiping. Reactions were extremely varied, ranging from immunity (*Agropyron elongatum*) to lethality. There were systemic symptomless carriers. It is concluded that the immunity of *A. elongatum* may be controlled by a complex mechanism and that attempts to transfer a satisfactory level of resistance from *A. elongatum* to wheat may meet with difficulty.

Swarup (V.), McCracken (Elizabeth U.), Sill (W. H.), & Schmidt (J. W.). **A cytogenetical analysis of reactions to Wheat streak-mosaic virus in certain Agrotricum hybrids.**—*Agron. J.*, 48, 8, pp. 374–379, 1 fig., 1 graph, 1956.

This information has already been noticed from another source [35, p. 439; cf. preceding abstract].

Porter (R. H.). **Seed treatment tests for control of Barley loose smut.**—*Plant Dis. Reptr*, 40, 2, pp. 106–111, 1956.

At Colorado Agricultural Experiment Station soaking in a 0·2 per cent. suspension of spergon for 48 hours consistently eliminated loose smut (*Ustilago nuda*) of barley [34, p. 590] in 1954, but it reduced germination from 405 (variety B 26) and 369 (B 6) plants per row in the untreated to 150 and 96, respectively. Treatment of B 26 seed by corking in a flask for 48 hours with 0·12 ml. panogen reduced the number of smutted heads from 9·5 to 2·2, but this was inadequate for practical purposes. In 1955, using Lico seed, a two-hour soak in water followed by retention in a corked flask for 23 hours eliminated smut or nearly so. Panogen (0·18 ml. in 130 ml. water, soaked two hours and sealed for 20) and spergon (0·2 per cent. suspension, soaked two hours and sealed for 23) reduced the number of smutted heads from 14·8 (untreated) to 1·2 and 0·75, respectively, with little or no effect on germination.

The advantages of panogen are that it is readily diluted in water and gives good control of barley covered smut (*U. hordei*) [see next abstract] and stripe (*Helminthosporium gramineum*) [loc. cit.] and partial control of seedling blight and root rot (*H. sativum*) [*Cochliobolus sativus*: 35, p. 96]. Spergon dust does not remain in suspension for long, while soaking seed in water gives no protection against soil-borne organisms.

Porter (R. H.). **Seed treatments for stripe and covered smut of Barley.**—*Plant Dis. Reptr*, 40, 2, pp. 112–117, 1956.

In 1954 and 1955 a number of fungicides were tested at Colorado Agricultural Experiment Station as barley seed treatments against stripe (*Helminthosporium gramineum*) [31, p. 178 and preceding abstract] and covered smut (*Ustilago hordei*) [loc. cit.; 33, p. 307], using naturally infected seed of several varieties. Ceresan M (2 oz. per bush.), panogen, merculine (both 0·75 fluid oz.), emmi, and merlane (both 2 oz.) all gave effective control of stripe in 1954, reducing the total number of diseased plants from 827 (untreated) to 52 or less, and the first two raised stand numbers significantly, while emmi reduced them. In 1955 ceresan M, merlane, and panogen all reduced the mean number of striped plants to less than 1, as against 4·25 to 11·75 for the untreated.

Panogen (1 in 100 parts water) and a 0·2 per cent. suspension of spergon reduced the total number of smutted heads in 1954 from 208 (untreated) to 1 and 0, respectively, but spergon reduced germination to 25 per cent. of the untreated. In 1955 the number of smutted heads was reduced from 311 to 1, 0, and 0 respectively by merlane (400 mg.), merculine (0·2 ml. in 2 ml. water), and panogen (0·2 in 20).

Pettinari (Carla M.). **Osservazioni su alcune 'elmintosporiosi' dei cereali in Italia.** [Observations on some 'helminthosporioses' of cereals in Italy.]—*Bull. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 157–169, 2 figs., 1956. [English summary.]

In this preliminary note the author describes the identification of some

Helminthosporium species isolated from wheat, barley, and oats in different parts of Italy. Her work confirms the presence in Italy of *H. gramineum* on wheat, barley, and oats [18, p. 580], *H. sativum* [*Cochliobolus sativus*] on wheat and barley [6, p. 531; 8, p. 457], *H.* [*Pyrenophora*] *teres* on barley, and *H.* [*P.*] *avenae* [map 105] on oats. If seasonal conditions favour infection, *H. gramineum* and *C. sativus* can cause appreciable damage in Italy.

Skoropad (W. R.) & Arny (D. C.). **Histologic expression of susceptibility and resistance in Barley to strains of Helminthosporium gramineum.**—*Phytopathology*, 46, 5, pp. 289–292, 4 figs., 1956.

The joint studies herein reported from the Plant Pathology Laboratory, Edmonton, Alberta, and the University of Wisconsin were carried out to determine the effects on the tissues of four barley varieties, differing in their reactions to *Helminthosporium gramineum*, of two strains of the pathogen, C–1 and GHA2 [24, p. 497], which had remained stable in cultural characters on potato dextrose agar and in pathogenicity for over 10 years. The inoculation technique described by Arny and Shands was used (abs. in *Phytopathology*, 32, p. 21, 1942). The Atlas variety (C.I. 4118) was highly susceptible to strain GHA2 and highly resistant to C–1, while Oderbrucker (C.I. 4666) gave the reciprocal reactions. Colsess (C.I. 5979) was highly susceptible to both strains and selection B 39–55 (Atlas × Oderbrucker) highly resistant.

In a susceptible variety the fungus penetrated the coleorhiza by means of appressoria and hyphal pegs, advancing intracellularly through the parenchymatous tissues and usually intercellularly through the meristematic areas. Once the mycelium gained a foothold in the entire length of the culm, rapid elongation of the seedling resulted in the establishment of isolated loci of infection in the internodes. Spread also occurred through the lumina of the xylem vessels. A similar course was pursued by the mycelium in the resistant varieties, in which, however, a host-parasite interaction was observed below the outer two or three cell layers. An apparently hypersensitive form of response resulted in the formation of necrotic pockets in the coleorhiza tissue, causing inactivation of the mycelium in that region and permitting normal development of the plant. Though the fungus damaged the roots considerably the mycelium rarely advanced from this site to the rest of the seedling.

[An abstract of this paper appears in *Proc. Canad. phytopath. Soc.*, 23, p. 20, 1955.]

Moseman (J. G.). **Physiological races of Erysiphe graminis f.sp. hordei in North America.**—*Phytopathology*, 46, 6, pp. 318–322, 1956.

At the North Carolina Agricultural Experiment Station six new physiologic races of *Erysiphe graminis*, numbered 14 to 19, and nine reported previously were isolated from mildewed barley plants collected in Canada and the United States from 1950 to 1954 [35, p. 760]. They were distinguished on the basis of their pathogenicity to the differential varieties Black Hulless, Chevron, Heil Hanna 3, Nepal, and Peruvian, and were compared with 13 races already known from North America [26, p. 386; 31, p. 279], three from Japan [33, p. 344], and two from Argentina [29, p. 353]. Most of the cultures were obtained from the south-eastern United States, where races 9 and 6 predominate; 3, 13, 18 were isolated in California, while the following were found in one State only: race 4 in Texas, 14 and 16 in Virginia, and 15 in North Carolina.

In pathogenicity tests with 49 cultures from conidia and 151 from ascospores the latter proved to be more variable in their effects. The differential varieties in current use for breeding programmes are considered inadequate for the determination of pathogenic variation in *E. graminis*, and studies are in progress to select individual genes for resistance in barley as criteria for race separation.

Trofimovskaya (Mme A. Y.) & Tsehanovskaya (Mme N. A.). Устойчивость различных сортов Ячменя к пыльной головне. [Resistance of different varieties of Barley to loose smut.]—Агробиология [*Agrobiology, Moscow*], *1956*, 1, pp. 62–69, 3 figs., 1956.

Investigations at the Pan-Soviet Institute of Plant Cultivation, Leningrad, U.S.S.R., on the resistance of barley to loose smut [*Ustilago nuda*: 33, p. 717] showed that infection is reduced in plantings from seeds produced in years when conditions led to slow vegetative growth and early maturity, but that conditions retarding earing and favouring vegetative growth contribute to open flowering and consequently to a high incidence of the disease in the following year.

Experiments at the Armenian S.S.R. Academy of Sciences showed that *U. nuda* can infect the flowers, young seeds, and seeds at the milk stage. The authors suggest that infection can probably take place also after flowering when the stigmas begin to die.

The following barley varieties showed high resistance in the laboratory: Hanna Loosdorf, Zalarinets, Kolhikum 10/30, Binder, Zolotoi [Golden], Primus, Spartan, and Armavirsky 593. In the field all except Spartan (very susceptible), and Armavirsky 593 (susceptible) showed a resistance above the average; Zalarinets was highly resistant.

Arny (D. C.) & Leben (C.). **Effect of storage on the fungicide content of Oat seed treated with mercury compounds.**—*Phytopathology*, 46, 6, pp. 342–344, 2 graphs, 1956.

Periodical tests on the fungicidal activity of ceresan M [see above, p. 11] (applied at the rate of 0·5 and 0·25 oz. per bush.) and panogen (0·75 and 0·375 fluid oz.) on oat seed stored at 26° C. in closed bottles [cf. 34, p. 361] are reported [34, p. 223]. After seven to nine days some of the seed from each treatment was left at the bottom of an open Petri dish, portions of this and the rest being assayed against *Glomerella cingulata* [31, p. 601] one, two, three, and four months after disinfection. Fungicidal activity was lost more rapidly from seed exposed to the open air than from enclosed seed, particularly from ceresan M. In practice, however, only a small proportion of treated seed is exposed to the air and the decline in fungicidal activity is probably unimportant, especially with seed-borne pathogens where the disinfectant action presumably operates early in the storage period.

Rivers (G. W.), Raab (Q. J.), & Atkins (I. M.). **A technique for inoculating Oat plants in their seedling stage to determine their action to Helminthosporium victoriae.**—*Agron. J.*, 48, 9, p. 428, 2 figs., 1956.

Previously reported methods [35, pp. 363, 519] of testing oats for reaction to *Helminthosporium victoriae* [cf. 35, p. 442], none of which is considered entirely satisfactory, indicate the necessity of removing the bloom from the leaf prior to inoculation with the spores. The method of gently rubbing the leaf surface with moistened fingers, in addition to being slow and laborious, injures seedlings and sometimes damages plants beyond recovery.

Experiments at College Station, Texas, during 1956 resulted in the discovery of an improved inoculation technique. A blended suspension of heavily sporulating cultures on potato dextrose agar was made with distilled water and dreft and applied to seedlings in the first leaf stage with a small electric paint sprayer. The inoculated plants were placed for 48 hours at 28° to 34° C. and 100 per cent. humidity, and afterwards kept in the greenhouse at 21° to 30°, where they dried after 18 to 24 hours. They were then easily classified according to symptoms.

Kiesling (R. L.) & Grafius (J. E.). **Several Oat varieties resistant to natural infection by Leptosphaeria avenaria.**—*Phytopathology*, 46, 6, pp. 305–306, 1956.

Of a total of 5,343 lines of the World Oat Collection tested for reaction to the

black stem and leaf spot phases of *Leptosphaeria avenaria* [35, p. 762] at the Department of Botany and Plant Pathology, Michigan State University, 40 were chosen for further trials, and nine of them (Nos. 1415, 4890, 5037, 5056, 5156, 5161, 5240, 5258, and 5335) were without infection from 1953 to 1955 under conditions favouring heavy natural infection in the very susceptible A 700–17 (Andrew × Landhafer). The resistant selections represent a range of maturity dates and agronomic types suitable for the State breeding project. In some of the lines resistance to the two phases of the disease operated independently.

Vallega (J.). **Variaciones en la población de Puccinia graminis avenae y sus consecuencias fitotécnicas.** [Variations in the population of *Puccinia graminis avenae* and their phytotechnical consequences.]—*Rev. Fac. Agron. Vet., B. Aires*, 13 (*1954*), 3, pp. 459–469, 1 map, 1955. [English summary.]

In addition to observations already presented from other sources on physiologic specialization in *Puccinia graminis* on oats and its distribution in Argentina [34, p. 775 *et passim*], it is reported that all varieties grown in the country are equally susceptible to races 3, 4, and 7, except that in tests those carrying the Joanette or Hajira factor have shown resistance to race 4. However, since Joanette is susceptible to race 7, it is recommended that descendants of Hajira, e.g., Garry and some other selections from Canada and the United States, should be used for breeding. Race 4 differs from 3 and 7 in its pathogenicity to varieties carrying the Richland factor for resistance to *P. graminis*.

Grasso (V.). **Prove orientative per la ricerca della semiletalità in alcuni carboni, senza il micromanipolatore.** [Exploratory experiments for the investigation of haplo-lethality in some smuts, without the micromanipulator.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 229–231, 1956. [English summary.]

The presence of haplo-lethal deficiency in certain smuts [cf. 35, p. 178] can be demonstrated without the use of the micromanipulator. From an infected spikelet of oats chlamydospores are transferred to potato dextrose agar, and on germination some of the basidiospores are carefully arranged over the whole surface of 2 per cent. water agar plates. Fusions then usually occur, with the development of aerial hyphae which can be seen with the naked eye after 15 to 20 hours. Occasionally, however, the basidiospores do not fuse, but bud considerably, and the absence of aerial hyphae shows that the mass of chlamydospores contains only one sexual group. Material from single sori from each ear should be examined separately as differences in genetic behaviour may be present.

This method can be used with *Ustilago kolleri* and all other species of *Ustilago* the sporidia of which mate on water agar with the formation of infective hyphae. With other smuts the micromanipulator is required.

St. Garay (A.). **Studies on the effect of ergot infection on Rye and on toxic substances in the sclerotium.**—*Phytopath. Z.*, 27, 1, pp. 60–72, 17 graphs, 1956.

This is a tabulated survey and discussion of the results obtained to date in the author's studies at the Medicinal Plant Research Institute, Budapest, Hungary, on ergot of rye (*Claviceps purpurea*), reference to which has already been made from other sources [35, p. 821].

Crane (P. L.). **Factors affecting resistance to Pythium seedling blight of Maize incited by Pythium ultimum.**—*Agron. J.*, 48, 8, pp. 365–368, 1 graph, 1956.

In tests carried out at Purdue University Agricultural Experiment Station, Lafayette, Indiana, to determine the site, nature, and inheritance of resistance to *Pythium ultimum* in dent corn [35, p. 445], the time required for the fungus to reach the embryo and endosperm was measured in sound seed samples inoculated by

incubation in a liquid culture of the fungus for 10 days before sowing in sand. After a suitable interval the pericarp was aseptically removed and the remainder of the kernel plated on water agar. If *P. ultimum* failed to grow within 48 hours it was assumed not to have penetrated the pericarp.

Seedling stands were scored on the scale: normal, 1, stunted, 0·5, blighted after emergence, 0·25, failure to emerge, 0.

Results indicated that part of the resistance resides in the maternal pericarp and part within the germinating embryo, each being distinct and genetically independent. There was no evidence of cytoplasmic influence. Ear to ear variation of seedling survival in muck soil at 50° F. was inversely associated with the quantity of sugars which could be leached from the kernel. This in turn was positively correlated with the free reducing sugars originally present. The high correlations within pedigrees where little or no segregation occurred between ears suggest that the sugar relationships are associated with environmental influences on the maternal plant.

Neal (N. P.) & Davis (J. R.). **Seed viability of Corn inbred lines as influenced by age and conditions of storage.**—*Agron. J.*, 48, 8, pp. 383–384, 1956.

Tests at Wisconsin Agricultural Experiment Station, Madison [35, p. 445], showed that viability of inbred maize seed produced in 1949 and stored and germinated at laboratory temperature was well maintained until 1953. In cold tests (50° F. for 10 days) viability of untreated seed, already very low in 1951, was improved by arasan dust, averaging 17 per cent. in 1956, as against 1 per cent. untreated. The 1949 seed stored at 40° averaged 90 per cent. germination in 1956 and 62 per cent. in the cold test. Treated 1951 seed stored at 40° germinated reasonably well under cold test conditions in 1956.

Nelson (R. R.). **A new disease of Corn caused by Curvularia maculans.**—*Plant Dis. Reptr*, 40, 3, pp. 210–211, 1 fig., 1956.

Curvularia maculans [cf. 34, p. 91 *et passim*] was isolated repeatedly during the summer of 1955 from maize throughout the coastal Plain of North Carolina and Georgia. The symptoms, appearing on the leaves and leaf sheaths as minute, straw-coloured lesions, frequently with a reddish brown margin, seldom reaching more than 5 to 7 mm. long but often coalescing, were reproduced in greenhouse inoculations and the fungus was recovered in pure culture. This appears to be the first report of *C. maculans* as a plant pathogen.

Leukel (R. W.), Porter (R. H.), & Webster (O. J.). **Sorghum seed-treatment tests in 1955.**—*Plant Dis. Reptr*, 40, 2, pp. 138–140, 1956.

In field trials for the control of sorghum kernel smut [*Sphacelotheca sorghi*: 34, p. 364] on Rancher sorgo, phygon at high rates of application (3 and 4 oz. per bush.) was the best of the nine fungicides tested, eliminating the disease at Fort Collins, Colorado, and Lincoln, Nebraska, and reducing the percentage infection to 3 and 1·6 at the two rates, respectively, at Beltsville, Maryland. It is, therefore, recommended as a disinfectant for sorghum seed with persistent glumes.

Porter (R. H.). **Rhizopus oryzae Went et Geerligs associated with injury to Sorghum seed.**—*Plant Dis. Reptr*, 40, 2, p. 141, 1956.

At Colorado Agricultural Experiment Station, Fort Collins, *Rhizopus oryzae* [cf. 29, p. 557] was found to be largely responsible for mould injury to stored samples of Ellis sorghum seed from the 1954 crop.

Klement (Z.). **A bacterial disease of Millet new for Hungary.**—*Acta microbiol. Acad. Sci. Hung.*, 1, 4, pp. 511–516, 2 figs., 1954. [Russian summary.]

At the Research Institute for Plant Protection, Budapest, *Xanthomonas panici* [cf. 18, p. 413] was shown to be responsible for streaky bacteriosis observed in 1952 on some experimental plots of millet [*Panicum miliaceum*] at the Research Institute for Crop Production at Martonvásár. The disease, not previously recorded in Hungary (but known in Russia, as well as in the United States and Bulgaria [loc. cit.]), affected the imported varieties Polish Red and Red of Saratov 853 and spread to Morocco Yellow and B. Friedrich Yellow. The early-ripening Omsk 9 and Kasan 56 remained healthy. Leaves of the affected plants developed light-green streaks, subsequently brownish, and finally ochre-yellow, which broadened at the nodes; brownish-red or occasionally dirty olive-green spots appeared along the streaks on the blades; bacterial ooze formed on the lesions under humid conditions. Maximum intensity occurred before flowering, and the grains became barren; the plants eventually died.

In greenhouse inoculation experiments typical symptoms were reproduced by spraying the plants with an aqueous culture suspension or by injecting a bacterial suspension in physiological saline under the panicle sheath. The bacterium was most easily identified by a serological agglutination method.

Basu Chaudhary (K. C.) & Sinha (S.). **Physiologic specialization in Puccinia penniseti Zimm. on Pennisetum typhoides Stapf & Hubb.**—*Agra Univ. J. Res. (Sci.)*, 4, 2, pp. 575–578, 1955. [Received June, 1956.]

In further work [cf. 34, p. 373] on rust (*Puccinium penniseti*) of pearl millet (*Pennisetum typhoides*) [35, p. 673] at Agra College the authors examined 20 varieties and found them all susceptible to the rust in the seedling stage. The types of rust reaction are recorded.

Olson (E. O.). **Mild and severe strains of tristeza virus in Texas Citrus.**—*Phytopathology*, 46, 6, pp. 336–341, 3 figs., 1956.

At the Texas Agricultural Experiment Station seedlings of Cleopatra mandarin, sour orange, Mexican lime, and Red Blush grapefruit were bud-inoculated in May, 1954, with tristeza virus [34, p. 91; 35, p. 603] from field sources of Matsui or Sueoka satsuma mandarin and observed for 16 months. In contrast to the Matsui strain, which induced only mild symptoms, the Sueoka inoculum caused chlorosis and severe stunting of Mexican lime and Red Blush grapefruit and reduced the growth of sour orange seedlings but did not noticeably affect mandarin. The symptoms on limes inoculated with the Sueoka strain were similar to or identical with those reported for a severe strain of the virus from Brazil [35, p. 447] and other countries in which both mild and virulent forms of tristeza occur.

A mild strain of the virus from a Meyer lemon tree inhibited the development of severe infection in lime plants bud-inoculated with Sueoka material: the effect persisted for 14 months and is considered to prove that the viruses causing severe and mild symptoms are related. On the other hand, the absence of any comparable effects in tests with cachexia, exocortis, and psorosis is taken to indicate that no relationship exists between these viruses and tristeza.

Wallace (J. M.), Reichert (I.), Bental (A.), & Winocour (E.). **The tristeza virus in Israel.**—*Phytopathology*, 46, 6, p. 347, 1 fig., 1956.

The authors record the discovery of tristeza virus on Meyer lemon in Israel, which has already been noticed [see next abstract]. The few trees of the variety, originating from a single introduction, were to be destroyed.

Reichert (I.), Bental (A.), & Yoffe (I.). **Transmission experiments on the tristeza and xyloporosis diseases of Citrus.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 69–75, 1 fig., 1956.

This paper and the eight following, all from the Agricultural Research Station, Rehovot, Israel, were contributions to the fourth International Congress of Mediterranean Citrus Growers, held in Israel in May, 1956. In preliminary transmission studies from 1953 to 1955 one-year-old Palestine sweet lime seedlings were budded from the following sources: Shamouti oranges on sweet lime stocks affected by xyloporosis [see following abstracts], similar healthy trees, Ellendale mandarin and Meyer lemon with suspected tristeza, and a xyloporosis-affected Shamouti on a Californian sour orange stock. A further series of sweet lime seedlings were inoculated by *Toxoptera aurantii* previously fed on two sources of xyloporosis-affected Shamouti oranges on sweet lime rootstocks. No leaf symptoms developed on these seedlings, which were indistinguishable from the uninoculated controls.

The presence of tristeza in Meyer lemon trees in Israel [map 289] was established by graft-inoculations on Mexican lime seedlings, which developed vein clearing symptoms. In an attempt to demonstrate the natural spread of tristeza Mexican lime seedlings were placed under infected Meyer lemons in the grove, but no leaf symptoms were observed on them during the ensuing 12 months [cf. 35, p. 764]. The virus was not transmitted from infected Meyer lemon trees by either *T. aurantii* or *Aphis gossypii* and it is tentatively concluded that natural spread of tristeza has not yet occurred in Israel.

Reichert (I.), Bental (A.), & Yoffe (I.). **On the problem of the identity of 'little leaf' and 'xyloporosis' diseases.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 77–82, 1 fig., 1956.

Evidence is presented in support of the hypothesis that the two most important citrus diseases in Israel, little leaf and xyloporosis [34, p. 34 and preceding and next abstracts] are identical. Both diseases were first observed in 1928, xyloporosis on Shamouti orange budded to Palestine sweet lime, and little leaf on Shamouti budded to sour orange rootstock. Symptoms common to both diseases include stunting, leaf-yellowing, erect branch growth, early blooming and fruiting, and progressive partial defoliation, followed by top decline. Affected Shamouti on sweet lime eventually die. Trees with either disease have a tendency to produce asymmetrical fruits, accompanied by a thinner rind at the stylar end of the asymmetrical half. The diseases differ in that strong pitting on the cambial face of the wood occurs in the sweet lime rootstock of xyloporosis-affected trees but rarely on the sour orange rootstock of trees with little leaf. Affected trees on sour orange decline more gradually and less severely than those on sweet lime.

A description is given of the symptoms induced by xyloporosis on 20 different species and varieties of citrus, all budded on Palestine sweet lime.

It is tentatively concluded that xyloporosis and little leaf disease are caused by the same organism.

Mendel (K.). **Rootstock-scion relationships in Shamouti trees on light soil.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 35–60, 1956.

This is a summary of the results obtained in the experimental citrus grove at Rehovot, Israel, in investigations for suitable rootstocks for Shamouti orange trees, during the past 18 years. Eight of the trees grafted on sweet lime rootstocks are declining, five due to xyloporosis [see preceding abstracts] and three from gummosis (*Phytophthora* spp.) [33, p. 348 and following abstracts]. Many of the rough and sour lemon stocks were attacked by *Deuterophoma tracheiphila* [23, p. 252] before they reached the budding stage. Trees on citron stocks were most affected by disease, 56 per cent. being attacked by gummosis. Scion development was weak

and unsatisfactory on grapefruit and shaddock, but all trees on Baladi sweet orange and on sour orange stocks are healthy.

Of the nine stocks tested for Shamouti oranges it is concluded that the health of those trees budded on rough and sour lemon, Baladi, and sour orange is very good. No pathological cause for the decline of some trees on Shamouti, shaddock, and grapefruit stocks has been found.

NADEL-SCHIFFMANN (MINA). **The use of pre-harvest copper sprays to control Phytophthora rot in Citrus fruit.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 111–117, 1956.

During the period 1945–54 spraying experiments were carried out in a grove in Mikve Israel to determine the effects of Bordeaux mixture ($\frac{1}{2}$ and 1 per cent.) and perenox ($\frac{1}{3}$ and $\frac{1}{2}$ per cent.) on the incidence of brown rot (*Phytophthora citrophthora*, *P. hibernalis*, and *P. parasitica*) [31, p. 604 and preceding and next abstracts] during the rainy season (December to March). Rotting was assessed according to the amount appearing after three to four weeks' storage at 18° C. and the number of rotted fruits on the trees and below them. It was markedly reduced by $\frac{1}{2}$ per cent. perenox and 1 per cent. Bordeaux [35, p. 446], the latter being more effective, reducing the percentage of brown rot in grapefruit from 19·4 (untreated) to 8·1, in Valencia oranges from 17·9 to 5·1, in Shamouti oranges from 10·2 to 3·3, and in lemons from 7·2 to 2·8. Differences between the various citrus species are attributed to the type of soil, rot being more severe on heavy soil, rather than to specific sensitivity. The majority of rotted fruits on sprayed trees were on branches up to 20 cm. from the ground, but occurred up to 50 cm. on unsprayed.

It is concluded that all citrus groves on heavy soil should receive pre-harvest sprays before the start of the wet season.

ZUKERMAN (I.) & NADEL-SCHIFFMANN (MINA). **Influence of fresh or irradiated limonene on fungi causing Citrus fruit rots.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 125–127, 1956.

At the Israel Institute for Biological Research, Nes Ziona, the lethal doses of limonene (the main constituent of orange essential oil) irradiated by sunlight were determined for 11 common fungi causing citrus fruit rots. *Phytophthora parasitica* and *P. citrophthora* [see preceding abstracts] were the most sensitive to the treatment, spore germination at 25° C. being inhibited by 150 to 300 p.p.m.; *Colletotrichum gloeosporioides* [*Glomerella cingulata*] and *Penicillium italicum* [see following abstracts] displayed intermediate sensitivity (400 to 500 p.p.m.); while the other test fungi, including *P. digitatum*, required 1,000 p.p.m. or more. In preliminary tests the percentage of *Phytophthora* rots in oranges was considerably reduced by treatment with irradiated limonene 24 to 48 hours after inoculation. Unirradiated limonene had no effect on the test fungi.

NADEL-SCHIFFMANN (MINA) & LITTAUER (F.). **Mode of infection of Penicillium digitatum and P. italicum in Citrus fruits.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 61–67, 1956.

Shamouti and Valencia oranges, Marsh grapefruit, and Eureka lemons were inoculated with dry spores of *Penicillium digitatum* and *P. italicum* [33, p. 347 and preceding and next abstracts]. *P. digitatum* produced higher infection percentages with both pricked and scratched inoculations than *P. italicum*. With pricked inoculations Valencia oranges were least susceptible, and Shamouti oranges and Marsh grapefruit the most; these differences were less marked on scratched fruits, when lemon was the least susceptible. Susceptibility of the two types of orange increased with maturity, that of grapefruit and lemon was almost unaffected by ripeness. All inoculations into the pulp gave 100 per cent. infection, and in all

the trials scratched inoculations gave a higher infection rate than pricked. Higher rates of infection were obtained with inoculations pricked into the oil glands than with those between, and at a relative humidity of 100 per cent. than at lower. Wounded cut stems were more susceptible than unwounded.

Littauer (F. S.). **Combined versus single treatments for the control of Citrus fruit rots.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 129–133, 1956.

Experiments carried out from 1948 to 1955 to find the most effective single or combined treatments for the control of rots during transit and storage of Shamouti oranges in Israel are summarized. All the seven treatments and combinations of treatment tested reduced rot incidence. Of the single treatments, diphenyl wraps [35, p. 676] gave the most reliable control, with 11·7 per cent. rotting (chiefly *Penicillium digitatum* and to a lesser degree *P. italicum*) [see preceding abstracts] after four to five weeks' storage at 18° to 20° C. compared with 63·9 in the untreated, 17·4 with the Brogdex treatment (borax dip with subsequent waxing), and 29·4 with Decco (gassing with nitrogen trichloride). In tests with Valencia oranges much smaller percentages of rotting were recorded. The borax treatment was less effective against stem-end rot (chiefly *Diplodia natalensis*) [see next abstract] than diphenyl. Of the combined treatments the amount of rotting in the Brogdex plus diphenyl after four to five weeks' storage at 18° averaged 5·2 per cent., with Decco plus diphenyl 5·6 per cent., and Decco plus Brogdex, 7 per cent. With all three treatments the percentage rotting under the experimental conditions was 4·2.

The good results obtained with combined treatments for controlling both moulds and stem-end rots were confirmed in commercial practice, the amount of rotting rarely exceeding the 6 per cent. tolerance level, even after four to five weeks.

Gutter (Y.). **The influence of growth regulators on the keeping quality of stored Clementines.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 119–123, 1956.

In an investigation of the effects of the growth regulators 2, 4-D and 2,4, 5-T on the development of rots (chiefly *Alternaria citri*, *Diplodia natalensis* [see preceding abstract], *Fusarium*, and *Colletotrichum gloeosporioides* [*Glomerella cingulata*]) in stored clementines [cf. 28, p. 393], dipping the fruit in the hormone solution reduced the amount of rotting (mostly stem-end) by 55 to 80 per cent. compared with the untreated, there being no difference between the two auxins. The most efficient treatment was a preliminary dip in 2, 4-D (500 p.p.m. for three mins.) or 2,4, 5-T (200 p.p.m. for 10 seconds) and then wrapping in diphenyl wraps. Rotting after nine weeks averaged 1 per cent. compared with 70·3 in untreated fruit in plain wraps. The action of the growth regulators is attributed to their ability to keep the buttons alive and green during storage.

Heymann-Herschberg (Lotte). **Effects of combined zinc and sulphur applications on zinc deficiency in Orange trees.**—*Ktavim* (*Rec. agric. Res. Sta.* [*Rehovot*] *Israel*), 6, pp. 83–89, 1 fig., 1 graph, 1956.

It was shown that applications of zinc (as zinc oxide or zinc sulphate) could be successfully combined with sulphur and cure symptoms of zinc deficiency on mature Shamouti orange trees in Israel, with no damage to fruit or foliage.

Kozlova (Mme V. I.). О диагностике инфекционного шелушения коры Цитрусовых. [Concerning the diagnosis of infectious bark peeling of Citrus trees.] Агробиология [*Agrobiology, Moscow*], *1956*, 1, pp. 129–132, 3 figs., 3 graphs, 1956.

Investigations on citrus psorosis in the U.S.S.R. [34, p. 278] indicated that the mosaic symptoms which appear during the spring growth of the leaves, usually in

late May and early June, may serve as a reliable diagnostic feature of the disease. Of the 20 plantations examined, three were highly infected, with 7, 19·4, and 20 per cent. of the trees showing mosaic symptoms. Infection should be reported and controlled. No cuttings should be taken from infected trees.

Reichert (I.) & Chorin (M.). **Mal secco of Citrus in Israel and neighbouring countries.**—*Bull. Res. Coun. Israel*, Sect. D, 5, 2–3, pp. 176–180, 1 pl., 1956.

The authors discuss the characters distinguishing mal secco disease (*Deuterophoma tracheiphila*) of citrus [cf. 3, p. 523; 35, p. 447 *et passim*] from anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*] and blast (*Phytomonas* [*Pseudomonas*] *syringae*), with both of which it is frequently confused. At the Agricultural Research Station, Rehovot, Israel, isolations from freshly infected, red-tinted wood invariably yielded *Deuterophoma tracheiphila*, though in older branches *G. cingulata* was also present within the infected area. This contamination may have led some earlier workers to regard *G. cingulata* as the primary pathogen.

The best method of control consists in pruning away all infected parts in September and October, before the wet season sets in. Next in importance is the use of resistant varieties, the highly resistant Monachello lemon [32, p. 125] bearing well and producing fruits of acceptable size. Strong emphasis is placed on the need for constructing adequate windbreaks, especially in orchards near the sea or on hillsides. At present, the only stock that can be recommended for lemon is bitter orange. In Israel, sandwich-grafting (recommended by some Italian workers) has not given promising results; with bitter orange as the rootstock, the resistant grapefruit in the middle and lemon as the final graft, 21 per cent. infection developed after two years.

Winocour (E.). **The anatomy and histology of healthy and xyloporosis-affected Palestine sweet Lime rootstocks budded to Shamouti sweet Orange.**—*Bull. Res. Coun. Israel*, Sect. D, 5, 2–3, pp. 125–142, 4 pl., 1956.

An anatomical study at the Division of Plant Pathology, Agricultural Research Station, Rehovot, Israel, of the effects of xyloporosis [34, p. 34 and above, p. 23] on Palestine sweet lime rootstocks budded to Shamouti sweet orange showed that the thorn-like pegs on the cambial face of the bark [33, p. 536] consist of triangular masses of phloem tissue wedged into the wood which are accompanied by pathological changes in the wood and bark. Numerous large lesions in the older wood rings, occurring in radial, tangential, and vertical alignment, consist of cells resembling wound parenchyma, and are bordered by areas of distorted xylem tissue with abnormally orientated conducting vessels and wood fibres. Similarly distorted xylem tissue is also found adjacent to the phloem pegs. Gum impregnation of the altered wood tissues occurs, but seldom involves the lumina of conducting vessels. The phloem peg consists mainly of crushed, necrotic sieve-tubes and companion cells, lying between hyperplastic and hypertrophied phloem rays. Sieve tube necrosis also occurs in the puncturing phloem tissues both adjacent to and at a distance from the peg deformations. Gum impregnation of the affected bark is apparent, but does not extend across the bud-union into the tissues of the scion. It is considered that these alterations found in the wood and bark may be responsible for the decline of the tree.

A bibliography of 27 titles is appended.

Sourdat (M.) & Hasdenteufel (J.-E.). **La tristeza des Citrus.** [Tristeza of Citrus.] —*Fruits d'outre mer*, 11, 8, pp. 329–340, 9 figs., 1956.

The bulk of the information contained in this comprehensive study of the tristeza virus as observed in Brazil, which the authors visited in 1955, has already been noticed [cf. 35, p. 179 *et passim*].

Comelli (A.). **Les Citrus à Trinidad.** [Citrus in Trinidad.]—*Fruits d'outre mer*, 10, 5, pp. 187–194, 8 figs., 1955.

Discussing citrus diseases in Trinidad, the author states that the tristeza virus [map 289] has not yet appeared there. Gummosis caused by *Phytophthora* [spp.: 17, p. 171] has decreased. Anthracnose of limes (*Gloeosporium limetticolum*) [34, p. 709] has virtually halted lime cultivation in the more rainy districts of the island. Copper treatments are effective for prevention but are uneconomic. Shade protection by cultivation between hedges of *Gliricidia* or other trees reduces incidence but results in low productivity. Epidemic die-back of seedling limes [loc. cit.] necessitates grafting, generally on to sour orange stock. Scab (*Elsinoe fawcetti*) [32, p. 250] is widespread. Control in the nursery is mostly effected by spraying with Bordeaux mixture or other copper compounds, but shading to reduce dew formation may serve instead.

Ramakrishnan (T. S.). **Sunscorch in Areca.**—*Proc. Indian Acad. Sci.*, Sect. B, 43, 5, pp. 258–263, 9 figs., 1956.

In the States of Madras and Travancore-Cochin sunscorch is common in areca palms planted without adequate provision for shade. Damage, which consists of stem-splitting, with formation of cavities, sometimes resulting in breaking, is restricted to the south-western aspect of the trunks which dry and split under the action of the afternoon sun, being subsequently invaded by various fungi, commonly *Ceratostomella* [*Ceratocystis*] *paradoxa*, and sometimes *Ganoderma lucidum* [cf. 10, p. 787], *Lenzites* sp., and *Polystictus* sp.

Leyendecker (P. J.), Smith (A. L.), Cooper (W. E.), & Lett (L.). **Reduction in yield of Cotton caused by diseases in 1955.**—*Plant Dis. Reptr*, 40, 2, pp. 153–155, 1956.

Tabulated summaries, based on reports from 14 states, are given of the reductions in cotton yield caused by parasitic diseases in the United States [cf. 33, p. 537; 34, p. 645] during 1955 and from 1952 to 1955, inclusive. Over the four-year period the total loss due to seedling diseases, including *Rhizoctonia* sp., amounted to 1,756,319 bales, bacterial blight (*Xanthomonas malvacearum*) 851,508, *Verticillium* wilt (*V. albo-atrum*) 809,650, *Fusarium* wilt (*F. vasinfectum*) 785,164, boll rots (*Rhizopus* and other species) 739,904, and root rot (*Phymatotrichum omnivorum*) 566,138 in an aggregate of 6,359,772 bales lost.

Kamal (M.) & Wood (R. K. S.). **Pectic enzymes secreted by Verticillium dahliae and their role in the development of the wilt disease of Cotton.**—*Ann. appl. Biol.*, 44, 2, pp. 322–340, 2 graphs, 1956.

In studies on cotton wilt disease carried out at the Botany Department, Imperial College, London, an isolate from Uganda of *Verticillium dahliae* (which often produced a hyaline variant) was highly virulent to young cotton plants under greenhouse conditions. Its spread was followed in plants infected by root inoculation prior to transplanting and it was isolated from stems and leaves well in advance of the appearance of disease symptoms.

In culture [cf. 2, p. 149] protopectinase was produced in the absence of pectic materials, but more active preparations were obtained with media containing pectic substances. There was, in general, a close connexion between protopectinase activity and the toxicity of the culture filtrates to parenchymatous cells. The two activities were to some extent separated by heating enzyme solutions or plasmolysing the test tissue. Protopectinase in solution displayed little pectinesterase activity, but quickly reduced the viscosity of solutions of pectic materials, and on the whole its properties resembled those of the viscosity-reducing enzyme.

Placed in cell-free filtrates from cultures of *V. dahliae* young cotton shoots wilted rapidly, though less so when conditions were unfavourable for transpiration. It was established that wilting resulted from the uptake of thermostable compounds of high molecular weight which impeded the upward flow of the vascular sap. Conspicuous vascular browning occurred only when solutions containing protopectinase were used. Wilting and vascular browning were obtained with solutions having little pectinesterase activity, one with high pectinesterase activity giving relatively little vascular browning.

The results obtained demonstrate that the secretion of pectic enzymes by *V. dahliae* depended largely on the presence in the media of pectic substances. That protopectinase was secreted in response to various moderately well-defined pectic materials is circumstantial evidence that the substances degraded during maceration were similar to those which were added to media to stimulate production of the macerating enzymes.

The toxicity of filtrates variously derived or treated was, in general, closely related to their protopectinase activity, which supports the view that the enzymes responsible for maceration also kill cells, directly or indirectly. The evidence suggests that more than one enzyme is responsible for the maceration and killing of cells. If *V. dahliae* produces more than one pectic enzyme they may, perhaps, play different parts in maceration and killing of cells and differ in their thermolability. While wilting was caused by thermostable substances of high molecular weight, vascular browning was associated with thermolabile substances, presumably proteins. Whether vascular browning is produced by pectic or other enzymes remains to be determined [cf. 34, p. 266].

Ganhão (J. F. P.). **Cephalosporium lecanii Zimm. Um fungo entomógeno de Cochonilhas.** [*Cephalosporium lecanii* Zimm. An entomogenous fungus of Cochineals.]—*Broteria*, 25, 2–3, pp. 71–135, 2 pl., 1 fig., 3 graphs, 1956. [English summary.]

This important contribution from the Laboratory of Plant Pathology 'Verissimo de Almeida', Lisbon, to the knowledge of *Cephalosporium lecanii* [34, p. 596], opens with a historical and general account, followed by a review of the literature and a tabulated survey of the geographical distribution of the fungus. Of the 25 plant species serving as hosts to the 20 Homoptera (mainly coccids) parasitized by *C. lecanii*, 12 do not appear to have been recorded previously: they comprise 10 from Portugal, namely *Laurus nobilis*, quince, *Hibiscus rosa-sinensis*, *Hedera canariensis*, *Myrica faya*, *Cercis siliquastrum*, holly, *Arbutus unedo*, oleander, and *Myrtus communis*, and two from the Cape Verde Islands, *Khaya senegalensis* and guava. Specimens of *Saissetia oleae* and *Coccus hesperidum* collected on orange were parasitized by a possible variant of *Cephalosporium lecanii*, with a more rapidly growing mycelium and slightly larger conidia (12 to 26 by 1·4 to 2·1 as against 10 to 25 by 1 to 1·4 μ), which also induces different symptoms on the insects.

The effects of parasitization by *C. lecanii* on *Ceroplastes sinensis*, *Coccus hesperidum*, *C. viridis*, and *S. oleae* are described. The fungus was detected in the totally disorganized internal tissues, access to which was apparently gained through the integument. The eggs of *S. oleae* were also infected.

The culture media used were potato, 2 per cent. potato dextrose, bean, carrot, malt, and Dox agars (in decreasing order of suitability). Conidial production was abundant at a temperature of 23·5° but sank to a minimum at 26° and upwards. The optimum for growth (within a range of 12° to 26°) was 23°. A very high relative humidity (approaching saturation point) was essential for conidial germination, which proceeded most rapidly in an aqueous suspension.

C. hesperidum and *S. oleae* were the most susceptible of the insects used in inoculation tests on the instars, with a mortality of 97 and 88 per cent., respectively,

followed by *Ceroplastes sinensis* (78). The profuse sporulation and strong virulence of freshly isolated cultures declined considerably on subculturing, and by the end of a year their pathogenicity was greatly reduced. The mainland strain was much more virulent than that from the Azores, but both were incapable of attacking *Aspidiotus hederae*, *Chrysomphalus dictyospermi*, and *Lepidosaphes beckii*.

Cruickshank (I. A. M.). **A further note on the physiologic specialization in Melampsora lini (Ehrenb.) Lév. in New Zealand.**—*N.Z.J. Sci. Tech.*, Sect. B, 38, 2, pp. 85–88, 1956.

At the Plant Diseases Division, Christchurch, of the 14 physiologic races of *Melampsora lini*, excluding three previously recorded and not now available [32, p. 79], distinguished between 1952 and 1955 on linseed and flax grown in New Zealand, only one, R. (N.Z.) 1, corresponded in reaction to any race recorded and classified by Flor [35, p. 891]. The classification of the New Zealand races, using Flor's new differentials [loc. cit.], revealed no well-known genetic source of resistance which could serve for plant breeding purposes in New Zealand. Ottawa 770 B and Bombay, however, while susceptible to a number of races are not both attacked by any one race, and might combine genes that would produce resistance to all the known races [cf. 33, p. 221].

Many of the 14 physiologic races are very virulent and new races are constantly being identified in New Zealand, but few are of economic importance.

Schwinghamer (E. A.). **Physiologic specialization in Colletotrichum linicolum.**—*Phytopathology*, 46, 6, pp. 300–305, 2 figs., 2 graphs, 1956.

The information in this paper on physiologic specialization in the agent of flax anthracnose (*Colletotrichum linicola*) has already been noticed from another source [34, p. 367].

Dániel (Á.). **Effect of Colletotrichum lini (Westrd.) Tochiani upon the retting process of Flax.**—*Növénytermelés*, [4], 4, pp. 361–364, 1955. [Abs. in *Hung. agric. Rev.*, 5, 1, pp. 4–5, 1956.]

Laboratory studies in Hungary showed that infection of flax by *Colletotrichum lini* [*C. linicola*: 35, p. 451] had an adverse effect on retting, resulting in an uneven quality of the retted product. The pH of the retting fluid decreased more slowly when the stalks were infected, indicating a slower development of the retting microflora.

Szirmai (J.). **A new virus-disease of our Tulips.**—*Kertész. Szölész., 1955*, 11, p. 17, 1955. [Abs. in *Hung. agric. Rev.*, 6, 2, p. 11, 1956.]

Tulip necrosis or browning virus disease [? tobacco necrosis virus: cf. 35, p. 89] was noticed for the first time in Hungary in 1955, affecting mainly King Harold and Baron de Latonnay. The symptoms [28, p. 290] included round, sunken, brown spots on the bulbs; the plants grew to only half their usual size and were killed.

Good control was obtained by treating the soil with 0·25 per cent. formalin (2 kg. per cu. m.).

Bald (J. G.), Ferguson (J.), & Markley (B. B.). **Treatment of Gladiolus cormels.** *Calif. Agric.*, 10, 6, pp. 15–16, 1 fig., 1956.

The authors describe a hot-water treatment of gladiolus corms already noticed [34, p. 787], which has proved successful on a commercial scale. Prior to this treatment (applied between one and four months after lifting) the corms are soaked

in water for two days at air temperature, and then immersed in a 1:200 dilution of 37 per cent. formaldehyde for four hours.

Scanzerla (M.). **Ricerche sulla patogenicità e sull' epidemia di Botrytis gladiolorum nei Gladioli.** [Studies on the pathogenicity and on the epidemiology of *Botrytis gladiolorum* on Gladioli.]—*Phytopath. Z.*, 27, 1, pp. 41–54, 14 figs., 1 graph, 1956. [German summary.]

Isolated in test tubes on malt agar at the Institute of Plant Pathology of the University of Milan, Italy, *Botrytis gladiolorum* [34, p. 725] formed only sclerotia, but conidial development could be induced on mycelium on glass slides or sterilized leaves of the host. *Tritonia crocosmiiflora*, *Acidanthera* sp., and *Hippeastrum hybridum* growing in proximity to infected gladioli yielded fungi similar to or identical with *B. gladiolorum*.

The inoculation of healthy Picardy corms with mycelium of *B. gladiolorum* resulted in the development of plants showing typical symptoms of the spongy rot. Leaf inoculation also gave positive results, young, succulent tissues being the most susceptible, especially at the fourth-leaf stage and before the close of the growing season. Experiments showed that the fungus passes from the corm to the leaves and vice versa. Newly formed corms contract infection from the mycelium harboured by diseased leaves or old corms. Other sources of infection are sclerotia in the soil, either on diseased leaves or from a previous crop. The conidia on infected leaves are the principal agents of transmission from plant to plant.

Clark (Marjorie R.) & Paton (A. M.). **A new bacterial disease of Dahlias caused by Pseudomonas marginalis.**—*Plant Path.*, 5, 1, pp. 32–35, 1 graph, 3 figs. (between pp. 18 and 19), 1956.

During the past two years a new disorder of dahlias has occurred in several parts of western Scotland. It causes most trouble on young cuttings rooted very early in the year, though mature plants are occasionally attacked. Affected cuttings have flaccid stems, and the bases are slightly shrivelled and dry. A wet, black rot develops in the adjacent part and spreads rapidly through the young shoot. Cuttings attacked later display an interveinal blackening of the leaf tissues, which also spreads rapidly through the shoot. Plants attacked when mature are dry and pale, and infection is usually confined to one or two shoots.

Isolations from diseased material yielded *Pseudomonas marginalis* [cf. 35, p. 68]. The same organism was also found in random specimens of unaffected parent stock cuttings, greenhouse soil (whether bearing cuttings or not), and dormant tubers. Except in the case of unrooted cuttings, which must be regarded as highly susceptible to the disease, it appeared that large numbers of the organism could be present in the different tissues without any disease being apparent.

The water in the greenhouse tank was found to be infected and drippings from boxes of dahlia stools above the propagation bed were another possible source of infection, the removal of which reduced the severity of attack. It was further ascertained that the disease lessened with increased daylight and consequent stronger growth, and as the days lengthened it became increasingly difficult to obtain positive inoculation results. A minimum daylight period is therefore important for control.

P. marginalis was found to be very susceptible to streptomycin in the laboratory; in field conditions various treatments with solutions of it plus a spreader were used as a spray after planting (1,000 international units per ml.) or as a one-hour dip before (220 international units per ml.). Only 36 per cent. control resulted, perhaps because streptomycin decomposes rapidly in soil. The use of this antibiotic in more direct contact with the plant is being investigated.

ROLAND (G.). **La lutte contre les maladies à virus du Chrysanthème, improprement appelées 'Maladies de dégénérescence'.** [The control of virus diseases of the Chrysanthemum, incorrectly termed 'degenerative diseases'.]—Reprinted from *Bull. hort.* 11, 6, 4 pp., 1 fig., 1956.

This is a short, popular article on virus diseases of the chrysanthemum [32, p. 559], describing hygienic measures recommended to growers in Belgium.

LELLIOTT (R. A.). **Slow wilt of Carnations caused by a species of Erwinia.**—*Plant Path.*, 5, 1, pp. 19–23, 1 pl., 1956.

In September, 1954, carnations growing in a nursery in Essex developed a slow wilt resembling the condition attributed in Holland to *Pseudomonas caryophylli* [34, p. 369]. A different bacterium was consistently isolated, however, and subsequent isolates from a number of widespread sources agreed with it. The available evidence indicated that the disease had been introduced into England after 1950, probably in the first instance, and certainly subsequently, from Holland.

Young infected plants can often be distinguished by their unthrifty appearance, pale colour, and staring habit, and by the flaccidity and loss of bloom of the leaves. A slow, progressive wilt develops, and the plants turn grey-green. These symptoms usually persist over many months (in one case nearly a year) before the plant finally dies. The inner wood is usually brown at the base, the discoloration tailing off into streaks which become pale, dry, and frayed towards the top of the stem. The bacteria were present mainly in the vessels, there being little dissolution of these and no necrosis of the surrounding tissue. The organism, studied at the Plant Pathology Laboratory, Harpenden, had motile cells with 3 to 14, usually 8 to 11, peritrichous flagella. Despite certain differences, it may be regarded provisionally as a strain of *Erwinia chrysanthemi*.

MUNNECKE (D.). **Survival of Xanthomonas pelargonii in soil.**—*Phytopathology*, 46, 5, pp. 297–298, 1956.

In further experiments at the Department of Plant Pathology, University of California, Los Angeles, geranium (*Pelargonium hortorum*) plants inoculated with *Xanthomonas pelargonii* were ploughed under in a field of heavy loam soil. Immediately thereafter and at intervals of one to 12 months, 15 or 18 rooted cuttings of the Radio Red variety were planted in each of four randomized blocks spaced 3 ft. apart. The percentages of infection after one day and one, three, or 12 months were 100, 20, 11, and 0, respectively. Plants in the last-named series remained healthy over a further six-month period.

It is clear from the foregoing data and those already reported [35, p. 189] that *X. pelargonii* cannot survive for lengthy periods in moist soil.

GIGANTE (R.). **Nota preliminare sopra un mosaico osservata sulla Salvia sclarea.** [A preliminary note on a mosaic observed on *Salvia sclarea*.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 67–77, 9 figs., 1956. [English summary.]

In the summer of 1955 the author visited some *Salvia sclarea* plantings near Ravenna, Italy, in which an appreciable percentage of the plants displayed mosaic-like symptoms. In most cases, yellowish, circular or polygonal areas 1 to 5 mm. wide were scattered irregularly over the whole leaf blade, some of the spots enlarging and becoming confluent. In other instances, however, the chlorotic areas were situated either between two lateral veins, the chlorosis becoming progressively more marked and a green area remaining next the veins, or the chlorosis appeared on the veins. In extreme cases no green colour remained. These various symptoms might be present on the same plant and symptoms might vary on the same leaf.

No pathogen was found, but when leaves of healthy *S. sclarea* plants were inocu-

lated by rubbing with sap from affected leaves, a faint interveinal chlorosis appeared after ten days; three weeks after inoculation this had become more conspicuous, the normal green parts near the veins being in marked contrast. Two months after inoculation the symptoms of the interveinal mosaic were still apparent only on the inoculated leaves. No indication of seed transmission was obtained.

The disease was similarly transmitted to tobacco, *Nicotiana glutinosa*, and bean [*Phaseolus* sp.]. On tobacco the mosaic appeared as pale green or yellowish spots scattered irregularly over the leaf blade; on *N. glutinosa* the spots developed along the veins; and on the bean leaves they were interveinal. In tobacco and *N. glutinosa* infection appeared only on the inoculated leaves, but in the bean it became systemic.

The virus causing this disease appears to be different from those previously recorded on *Salvia* spp. [cf. 16, p. 387; 29, p. 620; 31, p. 273], which are reported to produce different symptoms on the indicator plants. Further work is in progress.

Castillo (B. S.), Yarwood (C. E.), & Gold (A. H.). **Canna-mosaic virus.**—*Plant Dis. Reptr*, 40, 3, pp. 169–172, 2 figs., 1956.

At the Department of Plant Pathology, University of California, Berkeley, canna mosaic virus [27, p. 364], common on *Canna generalis* in the San Francisco Bay area, was successfully transmitted to various species of canna and to maize by *Aphis gossypii*, *A. maidis*, and *Myzus persicae* and by means of sap. The latter method was also successful for inoculating bean (*Phaseolus vulgaris*) which proved a useful host, local lesions being followed by systemic infection and the virus attaining a higher concentration than in canna. Inoculation of bean was more effective when the inoculum was suspended in 0·5 per cent. aqueous potassium monohydrogen phosphate than in water, when the upper surfaces of the leaves were inoculated rather than the lower, and when the growing point of the plant was removed. Rods about 715 mμ long were found in the petals of systemically infected canna, but not in the leaves, and similar rods, 765 mμ long, in bean leaves. The half-life of the virus in the phosphate solution was about 76 minutes.

Hennen (J. F.) & Cummins (G. B.). **Uredinales parasitizing grasses of the tribe Chlorideae.**—*Mycologia*, 48, 1, pp. 126–162, 27 figs., 1956.

This taxonomic account of the species of Uredinales parasitizing grasses of the tribe Chlorideae is based on a thesis an abstract of which has already been noticed [34, p. 322]. The species studied include *Puccinia sparganioides*, recorded on *Spartina brasiliensis* (among other hosts) and *P. dietelii* on *Chloris gayana*.

Lebeau (J. B.) & Cormack (W. M.). **A simple method for identifying snow mold damage on turf grasses.**—*Phytopathology*, 46, 5, p. 298, 1956.

In turf plugs 3 in. in diameter of *Agrostis tenuis*, *A. palustris*, *Poa pratensis*, and *Festuca rubra* infected by the unidentified low-temperature basidiomycete causing snow mould in Alberta, Canada, the average concentration of hydrogen cyanide [33, p. 430], steam-distilled into a 2 per cent. potassium hydroxide solution and determined by Robbie's phenolphthalein method (*Arch. Biochem.*, 5, pp. 49–58, 1944), ranged from 5 to 96 p.p.m. for those collected on 18th and 1st April, respectively. No trace of the gas was detected in samples collected on 1st May (higher temperatures apparently volatilizing it), in the undamaged controls, or in turf killed by other causes.

Since the same fungus is responsible for winter crown rot of lucerne and other fodders in Western Canada [35, p. 528], this simple and time-saving technique may also be applied to such crops in the early spring.

Emery (D. A.) & Dunn (G. M.). **Selection in smooth Bromegrass for resistance to Pyrenophora bromi (Died.) Drechsl.**—*Agron. J.*, 48, 9, pp. 398–401, 1956.

This report gives results of the breeding programme carried out at the New

Hampshire Agricultural Experiment Station between 1952 and 1955 for selection of strains of brome grass (*Bromus inermis*) resistant to brown leaf spot (*Pyrenophora bromi*) [34, p. 302], which is the major leaf disease in the State. In the greenhouse seedlings were inoculated at about 3 months of age with suspensions of agar cultures 13 to 14 days old, applied with a paint sprayer. They were rated for infection at about 7 to 10 days, and clones about 14 days after inoculation. In the field a small handful of infected dried leaves was applied to each plant after clipping. Infection on seedlings seemed better with agar than with grain cultures. It is not known why infection was better on parental clones than on seedlings.

Significant correlations were obtained between the reaction of parental clones and their open-pollinated progenies in the greenhouse, between seedling and mature plant reaction in the greenhouse, and between different clones of the same plant. Some selections have shown good resistance in the field for 2 or 3 years.

In the field first symptoms of *P. bromi* appear to be closely associated with humidity, and the disease is particularly destructive in spring and autumn. In the nursery infection seems to build up over a period of years.

ADSUAR (J.). **A virus like disease of Sorghum in Puerto Rico.**—*J. Agric. Univ. P.R.*, 40, 2, pp. 126–127, 1956.

At an agricultural substation in Puerto Rico two stools of Merker grass, a variety of *Pennisetum purpureum* [cf. 35, p. 548], developed virus-like symptoms, in particular a creamy-yellow freckling and striping of the leaves, especially the upper ones. Reddish specks appeared on the chlorotic tissues, leaves sometimes did not open normally, and the plant became stunted. The symptoms were transmissible through cuttings, immersion of these in water at 52° C. for 20 minutes giving healthy plants. The disease somewhat resembles both freckled yellows and stripe of sorghum as reported in India [17, p. 169].

WIT (F.). **A possible virus disease in Lolium perenne.**—*Euphytica*, 5, 2, pp. 119–129, 3 figs., 1956. [Dutch summary.]

During the past few years two types of abnormality have been observed in clonal plantings of perennial rye grass (*Lolium perenne*) at the Foundation for Agricultural Plant Breeding, Wageningen, Holland, and in the nurseries of several grass-breeding firms in other parts of the country. In early spring certain plants develop short, thick, stiff leaves. Elongation of the sheath is inhibited and the blades become blue-green and crinkled. There are often irregular or elongated protuberances on the under surface. In the initial stages excessive tillering often occurs, with extreme stunting, resulting in a thick, dwarfed type of growth. During spring and early summer most of the affected leaves turn yellow or pale orange, and in midsummer they usually form a dark brown, curled-up mass; most of the plants then die. Vigour progressively declines, relative to normal individuals. Heading may be completely inhibited or the culms may wither before the ears emerge. If flowering occurs, few seeds are set.

The second group of symptoms usually becomes noticeable later in the season. Affected plants are somewhat stunted and the apical half of the leaf turns yellow, orange, or pale red, while the culms or complete tillers wither. Tillering becomes suppressed and some of the old tillers die, with the result that diseased plants present a lax appearance.

No visible pathogen appeared to be present, but when aphids (*Rhopalosiphum padi*) were fed on affected plants of both groups for four days and then transferred to oat and barley seedlings, typical symptoms of cereal yellow dwarf virus disease [33, p. 74; 35, p. 761] developed in three weeks. This virus has been found in a small percentage of winter cereals in Holland and symptoms were seen on self-sown barley, wheat, and oats in 1954. It would appear that the two groups of symptoms

may be due to the same virus, the first developing on plants infected the year before, the second resulting from current season infection. Whether the virus is alone responsible for the damage has not yet been ascertained.

Spread was at first prevented by using only healthy plants for vegetative propagation, but when affected plants also were used to establish a clonal field the number of infected clones increased from 44 per cent. in June to 59 per cent. in October, the total loss amounting to 19 per cent. Clones from plants recently selected were much more affected than those which had undergone repeated vegetative selection. Some clones remained healthy though surrounded by severely diseased plants.

Kreitlow (K. W.) & Yu (Helen S.). **Host range, temperature relationships, and pathogenicity of Cercospora loti.**—*Phytopathology*, 46, 5, pp. 269–272, 1 fig., 1956.

In controlled temperature tests at the Field Crops Research Branch, Beltsville, Maryland, most cultures of *Cercospora loti*, the agent of a leaf spot of *Lotus uliginosus* in Florida, Georgia, and Maryland [35, p. 22], grew best between 25° and 30° C. All varieties and selections of *L. uliginosus* were equally susceptible to infection and *L. wrightii* was another species to which the maximum rating of 5 was allotted. *L. scoparius* and *Dorycnium rectum* were assigned to the next category of 4, *L. hispidus* and *D. herbaceum* were intermediate in reaction (3), *L. corniculatus* and *L. filicaulis* comparatively resistant (2), while a high degree of resistance (1) characterized *L. ornithopodioides*, *L. tenuis*, *L. tetragonolobus*, and *Tetragonolobus siliquosus*; only *L. peregrinus* was immune (0). Among the related species tested Ranger lucerne and Dixie Wonder field pea were relatively resistant, while only a trace of infection developed on *Anthyllis vulneraria*. There was some difference in virulence between seven monospore isolates from different areas, but this was probably attributable to genetic variability in the limited numbers of test plants.

Hanson (C. H.), Cope (W. A.), & Allison (J. L.). **Tar spot of Korean Lespedeza caused by Phyllachora sp. Losses in yield and differential susceptibility of strains.**—*Agron. J.*, 48, 8, pp. 369–370, 1 fig., 1956.

Light outbreaks of tar spot caused by *Phyllachora* sp. on Korean lespedeza [34 p. 155] have been observed in North Carolina for some years, and in Missouri it was estimated that this species caused 30 per cent. leaf drop in some commercial fields, but it was not until 1955 that damage became sufficiently great for consideration in breeding programmes. At North Carolina Agricultural Experiment Station, Raleigh, 34 lespedeza selections from the F_1 of an F.C. 31850 × Rowan cross were tested for resistance. A positive correlation was obtained for tar spot incidence and leaf loss. Tar spot was not correlated with date of flowering but appeared to induce early maturity. There was a strong negative correlation with seed yield. The six lines in the most susceptible class suffered severe defoliation and premature ripening, and yielded only 30 per cent. as much seed as the four lines in the most resistant class. The hay yield was not affected, but as it is the custom on North Carolina farms to cut the hay crops later than the date used in these experiments, it appears likely that defoliation could reduce the yield of susceptible varieties and affect the quality.

Graves (C. H.) & Hagedorn (D. J.). **The Red Clover vein-mosaic virus in Wisconsin.**—*Phytopathology*, 46, 5, pp. 257–260, 1 fig., 1956.

In general, the symptoms of natural infection by red clover vein mosaic virus on red, alsike, and Ladino clovers, *Melilotus officinalis*, and *Medicago lupulina* in Wisconsin [33, p. 485] consist exclusively of chlorosis of the main and secondary veins. During 1951 and 1952 the incidence of the disease in five counties of the State was remarkably high, the means of red clover stands ranging from 7 to 28

per cent. compared with 1 to 15 (average 5) for other [unspecified] viruses. Red clover vein mosaic virus was endemic among leguminous weeds along roadsides and on waste ground, indicating the importance of such plants in its perpetuation. The leaves, stems, crowns, and roots of red clover and *Melilotus officinalis* were found to harbour the virus. Its gradual introduction and increase in red clover fields from the time of sowing until the substitution of other crops are considered to afford definite though indirect evidence of the potentialities of the plant as an overwintering host of the virus. *M. officinalis* and alsike clover are presumed to serve the same purpose.

C. H. Graves has demonstrated the transmission of red clover vein mosaic virus by a small clover aphid, *Myzocallis onomidis* (Thesis, University of Wisconsin, 1954), which might help to explain the prevalence of the disease in clover populations.

MATSUURA (Y.). **Studies on the relation between the micro-climate in the tuft of Chinese Milk Vetch (Astragalus sinicus L.) and the infection by Sclerotinia rot.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 6–10, 4 graphs, 1954. [Japanese, with English summary.]

In an experiment investigating the effect of time and rate of sowing on the incidence of *Sclerotinia* [*trifoliorum*] on *Astragalus sinicus* [34, p. 792] the rot was most severe in the thickest stands, owing to the greater humidity and smaller temperature variation than in the thinner stands.

Fruit spraying calendar.—*J.R. hort. Soc.*, 81, 10, pp. 449–452, 1956.

This comprises a spraying calendar for the amateur horticulturlist, covering fruit trees and bushes, cane fruits, and strawberries. There are notes on grease-banding and sackbanding.

STOREY (I. F.) & IVES (JUNE V.). **Spraying practice against Apple scab on Bramley's seedling in the Wisbech area in 1953 and 1954.**—*Plant Path.*, 5, 1, pp. 1–8, 1 diag., 3 graphs, 1956.

Parallel with the spore-trapping experiments carried out near Wisbech, Cambridgeshire, in 1953 and 1954 [35, p. 777], a survey was made (mostly within 10 miles of this experiment) of 40 orchards in the former year and 99 in the latter to estimate the relative value of the different fungicides used against scab (*Venturia inaequalis*) on Bramley's Seedling apples.

Both seasons favoured infection. An all-lime-sulphur programme gave poor control. Growers tended to favour an all-mercury programme. Captan gave extremely good results (mean scab assessment in 1954, 0·01 per cent., as against 4·2 per cent. for lime-sulphur only, 1·9 per cent. for lime-sulphur and mercury, 0·3 per cent. for Bordeaux mixture and mercury, and 0·8 per cent. for mercury only), and its effectiveness was confirmed on other varieties. Observations in 1955 indicated, however, that the use of captan entails greater risk of increasing mildew (*Podosphaera leucotricha*) than lime-sulphur or mercury [cf. 35, p. 830].

Not the total number of sprays but the number of applications made during the effective phase of ascospore activity, i.e., from their initial release until ten days after the trapping of the last, proved to be the decisive factor, which confirms the view that ascospores are responsible for the early outbreaks of scab. The best control was given by the curative application of mercurial fungicides, which allows much more accurate timing than protective spraying.

KIRKHAM (D. S.). **A culture technique for Venturia spp. and a turbidimetric method for the estimation of comparative sporulation.**—*Nature, Lond.*, 178, 4532, pp. 550–551, 1 graph, 1956.

At East Malling Research Station cultures of *Venturia inaequalis* and *V. pirina* [35, p. 471] are grown on cylinders of Whatman 541 filter paper standing in nutrient

solutions and supported by stainless steel rings in 6 by $\frac{1}{2}$ in. B.S.S. standard test-tubes. Media at pH 5·6, sterilized by filtration, are dispensed in 1 ml. aliquots aseptically into each tube. Inoculum concentration is adjusted to an approximate turbidity of 0·1, equivalent to 200,000 to 300,000 conidia per ml. The tubes are inoculated with suspension sufficient just to cover the cylinders and then incubated horizontally for 14 to 21 days at 18° C. Comparative sporulation is determined by turbidimetric estimations. Cultures of *V. inaequalis* are shaken vigorously, and those of *V. pirina* gently, with distilled water (6 ml.) for one minute.

The relationship between spore suspension dilutions and turbidity was almost linear over drum readings of 0·02 to 0·3, but beyond this range there was increasingly less linearity. It is therefore advisable to dilute suspensions at concentrations above this level.

Bowen (T. J.). **Nutrient disorders in Plums.**—*Qd agric. J.*, 82, 7, pp. 373–376, 3 figs., 1956.

Descriptions are given of the symptoms of three mineral deficiencies of plums in Queensland. Zinc deficiency [cf. 29, p. 569; 34, p. 230], most conspicuous in the Wilson variety, is corrected by a zinc sulphate spray (20 lb. per 80 gals. water) in July or early August. Foliage sprays during the growing period are ineffective. Magnesium deficiency [cf. 31, p. 559], recently observed on Angelina Burdett plums at Stanthorpe, may be corrected by soil applications of magnesium, e.g., dolomite (1 to $1\frac{1}{2}$ tons per acre) or Epsom salts (5 lb. per tree). As response is very slow supplementary foliage sprays containing magnesium sulphate (2 lb. in 100 gals.) and a casein spreader are recommended to start three weeks after bud burst and continue at monthly intervals.

Sulphur deficiency, frequently seen in inadequately fertilized young trees, e.g., Santa Rosa and Wilson plums in some parts of the Granite Belt, causes stunting and leaf mottling. Leaves retain their green veins for some time but those near the growing point are yellow to white. Dead areas develop between the veins and along the margin. Secondary growth is slight or completely absent. This disorder is remedied by applications of superphosphate, which incorporates a certain amount of calcium sulphate, or of copper sulphate (2 to 4 oz. per tree).

Dye (M. H.). **Intake of streptomycin by Peach leaves.**—*Nature, Lond.*, 178, 4532, pp. 551–552, 1956.

As part of a study of the activity of streptomycin against *Pseudomonas syringae* [35, p. 114] experiments were carried out at the Plant Diseases Division, Auckland, New Zealand, in which potted peach seedlings (variety Golden Queen) were sprayed with aqueous solutions of streptomycin sulphate and, after varying intervals, washed in running water for four minutes. Antibacterial activity was then determined by inoculation with *P. syringae*. As against 100 per cent. leaf infection of the control, there was 65 per cent. when washing took place three days after spraying with 100 μgm. per ml., this reduction being presumably due to the retention of streptomycin by the leaves when washing had removed it from the surface. Similar results were obtained by paper-disk assays against *Bacillus subtilis* [35, p. 35] A.T.C.C. 6633, the only extracts inhibiting the test organism being those from plants washed three days after spraying.

More conclusive evidence was obtained by painting solutions containing 1,000 μgm. per ml. streptomycin sulphate on the under surfaces of leaves for three consecutive days. After washing and inoculation of the upper leaf surfaces 11 lesions developed on treated and 71 on untreated leaves. Preliminary investigations indicate that the time required for effective entry of streptomycin sulphate into leaves depends on climate. The period was reduced when treated parts were held at high relative humidity.

It is concluded that though streptomycin can enter peach leaves there is no evidence of it becoming systemic.

Smith (W. L.), Haller (M. H.), & McClure (T. T.). **Postharvest treatments for reduction of brown and Rhizopus rots of Peaches.** —*Phytopathology*, 46, 5, pp. 261–264, 1956.

During the period from 1951 to 1954, 55 chemical sprays or dusts and 12 fumigants were tested as post-harvest treatments for the control of decay in commercially picked peaches inoculated with spores of *Monilinia* [*Sclerotinia*] *fructicola* or *Rhizopus stolonifer* [*R. nigricans*] at the Plant Industry Station, Beltsville, Maryland. In 1951 the fruit was obtained from packing sheds in Georgia and West Virginia and in subsequent years from wholesale houses in Washington, D.C. The relative efficiency of the fungicides at 75° F. was evaluated after six days, the time required for most of the fruits to ripen fully and for complete development of the symptoms due to *S. fructicola*, those of *R. nigricans* being already well defined after three days.

Both types of rot were effectively combated by a 0·1 per cent. spray of dowicide A and a combination treatment of 94 per cent. sulphur dust followed by fumigation with tetrachloroethylene [31, p. 388] (1 in 20,000). The latter process was carried out in 10 cu. ft. metal chambers, each equipped with an electric hot plate and fan. The samples, in open ½-bush. baskets, were placed in the chambers and the liquid fumigant, in shallow dishes, was put on the hot plates set for low heat. The chambers were then closed with a seal. One method consisted in five minutes' use of the hot plates, followed by fan circulation of the vapour for the same period, or the fumigant was volatilized at 75° to 85° while the vapour circulated for five minutes. These operations raised the temperature of the air by about 10° and that of the fruit by 3°. All the treatments were conducted within two or three hours of inoculation and lasted 24 hours, during which period 7 to 8 per cent. carbon dioxide accumulated in the chambers.

Berend (I.). **Recent data about the Verticillium-wilt of Apricot trees.**—*Növénytermelés*, [4], 3, pp. 285–288, 1955. [Abs. in *Hung. agric. Rev.*, 5, 1, p. 12, 1956.]

In experiments in Hungary 20 young apricot trees were potted in soil inoculated with pure cultures of *Verticillium albo-atrum* [27, p. 139] and the roots and crowns of three of them were wounded. After being transplanted into the field and subjected to severe frost the wounded trees developed wilt symptoms, the others remaining unaffected.

Morvan (G.). **Le dépérissement de l'Abricotier. I. Les différentes formes de dépérissement.** [Apricot wilt. I. The different forms of wilt.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 7, 2, pp. 211–227, 9 figs., 1956.

In this preliminary report on his investigation into die-back of apricot trees in the Rhône valley and Roussillon, France [30, p. 522], the author, after a historical review of the subject, describes the three main forms of the condition found locally: canker and gummosis [cf. 35, p. 376]; tracheomycoses associated with a *Verticillium* [unspecified]; and 'growth irregularity', described by Chabrolin as 'apoplexy' [5, p. 304; cf. 33, p. 162] and by Goidànich in Italy as 'leptonecrosis' [14, p. 455].

It is concluded that the various forms of die-back that affect apricot trees locally are often confused. Control is recommended by improved orchard hygiene, and better pruning methods and cultural practices. A bibliography of 26 titles is appended.

Lovisolo (O.). **Le Monilie dei fruttiferi.** [The Monilias of fruit trees.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 13 (*1955*), pp. 7–40, 3 pl., 1956. [English summary.]

In the first part of this paper, which is based on studies conducted from 1948 to 1955 at the Institute of Plant Pathology, Turin, and the Station of Plant Pathology, Rome, the author reports the finding in Piedmont of the following new hosts of *Monilia* [*Sclerotinia*] *fructigena* [cf. 34, p. 793]: *Amelanchier canadensis*, *Pyrus sieboldii*, *Crataegus oxyacantha*, and *Cornus mas*. *M.* [*S.*] *laxa* [loc. cit.] was found on fruits of *Prunus cerasifera* var. *pissardii*.

In the second part brief notes are given, with numerous references to the literature, on *Sclerotinia* diseases seldom or not before recorded in Italy, including *S. fructigena* on fruits of hazel [*Corylus avellana*: 31, p. 438], fig, medlar, persimmon, grapes, and blackberries; *S. laxa* on the buds, flowers, leaves, and twigs of *Prunus nana*; and both fungi on fruits of *P. spinosa*.

In the third part the author discusses, with further references to the literature, various aspects of the biology of *Sclerotinia* species with respect to the hosts usually infected by them. Emphasis is laid on the fact that infection by *S. fructigena* and *S. laxa* is widespread and the frequent infection by these species of wild and ornamental plants must be borne in mind when formulating control measures. A bibliography of 69 titles is appended.

Kester (D. E.), Brown (J. G.), & Aldrich (T.). **Copper deficiency of Almonds.**—*Calif. Agric.*, 10, 6, pp. 13, 16, 3 figs., 1956.

In the district of Paso Dobles, California, copper deficiency was diagnosed in 1952 in a few almond trees showing poor growth and rough bark, associated with gum flow from the trunks and lower branches, the latter symptom occurring especially in the varieties Ne Plus Ultra and Nonpareil, Texas-Mission gumming less. In 1955 characteristic copper deficiency leaf symptoms also occurred together with shrivelling of the kernels. Soil and leaf applications of copper both gave a response, spraying with 1 lb. copper chelate in 100 gals. water giving an average kernel weight of 1·07 gm. and no shrivelling as opposed to 0·75 gm. and 42 per cent. shrivelling in the untreated.

Wilhelm (S.) & Koch (E. C.). **Verticillium wilt controlled.**—*Calif. Agric.*, 10, 6, pp. 3, 14, 3 figs., 1956.

The author reports excellent control of *Verticillium* wilt [*V. albo-atrum*: cf. 35, p. 202] in a one-acre test plot of strawberries near Soquel, California, fumigated in November 1953 by injecting chloropicrin to a depth of 6 in. at a rate of 3 ml. (one injection) per sq. ft., requiring approximately 480 lb. per acre. In 1954 the yield was 9·8 tons per acre with a wilt incidence of 0·45 per cent. in the treated plot, compared with four tons per acre and an average of 11·3 per cent. infection, not including areas of complete failure, in the control plots. Roots of treated plants were exceptionally vigorous. In the following year this vigour persisted while the control crop declined, probably as a result of attacks by root invading fungi other than *Verticillium*.

The concentration of the fungus is high in the surface layers of soil, which must be moist if the treatment is to be effective, and sprinkling two days before treatment gave good results. If the soil is moist to the surface at the time of fumigation a light rolling will take the place of a water seal, as also will rototilling and rolling 24 to 48 hours after fumigation.

McGrew (J. R.). **Analysis of viruses causing Demaree and Marcus type 1 and type 2 symptoms in Fragaria vesca.**—*Plant Dis. Reptr*, 40, 3, pp. 173–175, 1 fig., 1956.

Studies at Beltsville, Maryland, on the symptoms produced by strawberry virus

complexes in the East Malling strain of *Fragaria vesca* demonstrated the occurrence in commercial stocks of Big Joe, Dorsett, Suwannee, and Kellogg's Premier strawberries of a new virus, latent C. Alone, this virus could not be distinguished by graft transmission to *F. vesca*, but in combination with latent A virus [33, p. 306], it caused the type 2 symptoms described by Demaree and Marcus [31, p. 288]. A combination of the mild mottle virus [33, p. 306] with latent A or with latent C produced type 1 symptoms in *F. vesca*, while all three viruses together caused type 1 plus type 2 symptoms.

Gray (E[lizabeth] G.) & Everett (H. F.). **Serious breakdown of Gooseberries.**—*Gdnrs' Chron. & Gdng ill.* (formerly *Gdnrs' Chron.*), 140, 16, p. 403, 4 figs., 1956.

A degeneration of gooseberry bushes, resulting in malformation of the leaves, little new growth, and no fruit, and rather similar to a disease described previously [28, p. 464], is reported from the Craibstone collection in northern Scotland. The disease, of unknown origin, was observed first in 1952 on Macherauch's Seedling which had deeply lobed leaves reminiscent of hawthorn. In 1955 the variety Matchless and six other varieties in the same collection developed similar symptoms, with the lobe margins markedly rolled downwards. The disease is believed to be present in other gardens of Aberdeenshire. Graft tests are in progress.

Pettinari (Carla M.). **Osservazioni preliminari sul parassitismo di Cycloconium oleaginum Cast. in Oliveti del Lazio.** [Preliminary observations on the parasitism of *Cycloconium oleaginum* Cast. in Olive groves in Latium.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 13 (*1955*), pp. 41–57, 7 figs., 1956. [English summary.]

The preliminary results obtained in tests near Rome to determine experimentally the best time for the autumn application of preventive sprays against the infection of olive trees by *Cycloconium oleaginum* [35, pp. 110, 531] showed that at this period the first infections occurred on 1st or 2nd October, when the maximum temperature was 20° C. and the minimum 12° and rain had been falling for two days. The incubation period of the fungus was a fortnight and usually it required not more than 18 hours at 18° to 20° to penetrate the leaf tissues [28, p. 467]. Infections continued to be found up to the end of January, 1956, the frequency with which they occurred varying with the date. It is tentatively concluded that spraying would have been most effective if carried out at the end of September.

Rosa (M.). **Prove di lotta contro Gloeosporium olivarum Alm. eseguite in provincia di Brindisi nel 1955.** [Experiments on the control of *Gloeosporium olivarum* Alm. carried out in the province of Brindisi in 1955.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 13 (*1955*), pp. 193–209, 1 fig., 1 diag., 2 graphs, 1956.

In 1955, olive trees growing in the province of Brindisi, Italy, where very heavy losses are sustained as a result of infection by *Gloeosporium olivarum* [34, p. 380; 35, p. 658], were sprayed on 7th May, 26th September, and 23rd October with 1·5 per cent. Bordeaux mixture, and with esso S.R. 406 (50 per cent. captan), siapadithane (65 per cent. zineb), and perenox solplant (50 per cent. active copper), each in an aqueous suspension at 0·3 per cent. As severe infestation by *Dacus oleae* occurred each treatment was combined with an insecticide.

Adequate control of *G. olivarum* was given by Bordeaux mixture and perenox (16·6 and 22·8 per cent. infection, respectively, at the first picking, and 10·8 and 15·1 per cent. at the second, as compared with 40·1 and 43·6 per cent. for the unsprayed controls). Siapadithane and S.R. 406, however, though reducing infection slightly, did not prove satisfactory, probably owing to lack of persistence. It is concluded that in this area two fungicidal applications, one at the end of September, the other at the end of October, should suffice to protect olive trees against *G. olivarum* until the end of December.

Guyot (H.) & Cuillé (J.). **Les traitements fongicides des Bananeraies. II. Efficacités des différents modes de traitements.—Rôle de l'huile.** [Fungicidal treatment of Banana plantations. II. Efficacy of different methods of treatment.—The rôle of oil.]—*Fruits d'outre mer*, 10, 3, pp. 101–107, 3 figs., 2 graphs, 1955.

In previous studies [34, p. 657] of control of *Cercospora musae* [*Mycosphaerella musicola*] on banana in Guadeloupe the authors had distinguished between fine mist and fogging. In further experiments to test the relative efficiency of fine mist and fine (as opposed to heavy) fogging, fine mist from a minimicron apparatus and fine fogging from a swingfog were applied at the rate of 24 l. of mixture per ha. to a six-month-old untreated plantation, each apparatus containing 9 l. fluid oil, 3 l. gas oil and 1 kg. zineb. Results showed the definite superiority of fine mist; fine fogging took longer and was less easy to apply.

Oil mist sprays and zineb-based hydrophobic dusts (10 per cent. zineb to 40 kg. of powder per ha.) both yielded good results, but the superiority of the oil mist (85 per cent. of the leaves undamaged at the end of the season) suggested that oil used alone might prove a sufficient protectant. In further tests oil plus zineb mist was markedly superior to fogging the same or oil alone, but the action of oil on *C. musae* is undeniable, though this may be due to inhibition caused by modifications in the surface of the leaf rather than to direct fungicidal action. Fine fogging is quite inadequate against heavy infection.

In view of reports of the injurious effects of oil fungicide on the growth of the fruit a plantation sprayed in the first year with an aqueous zineb suspension was treated in the second with an oil mixture. In the first there were 49 per cent. of leaves 25 to 50 per cent. destroyed, 8 per cent. lightly affected, and 12 per cent. healthy: in the second the figures were 7, 12, and 63 per cent. respectively. Allowing for climatic variations and for the normally greater productivity of the second crop the oil applications were accompanied by an increase in the average weight of the stems from 11 to 16 kg. In another test in an area where there was no leaf spot no difference in weight was noted between untreated fruit and fruit to which an oil mixture had been applied. It is nevertheless necessary to guard against leaf damage which may be caused accidentally by an excessive volume of oil or by poor quality of the oil itself.

Merny (G.). **Micro-essais de traitements contre Cercospora musae.** [Micro-tests of treatments against *Cercospora musae*.]—*Fruits d'outre mer*, 10, 6, pp. 225–235, 1 fig., 10 graphs, 1955.

The author describes a modification of his technique for the preliminary examination and selection of fungicides for use against leaf spot [*Mycosphaerella musicola*] of banana [34, p. 467]. Fungicides, in pairs, are subjected to three repetitions, started at intervals of a few days, in which their performance is compared with that of a commercial copper oxychloride preparation and with untreated controls. In each repetition four newly opened banana leaves subject to natural infection are used and each treatment is applied to four of 16 circles 6 cm. in diameter marked out in four symmetrical groups on the underside of the leaf. One group of four circles [loc. cit.] was found insufficient. The leaves are examined three times a week, the treatments being compared on the basis of the number of infection spots for each, recorded when the total on the control circles reaches or exceeds 120, or when the leaf starts to die if this occurs first.

Using this method 24 fungicides were segregated into four categories: (*a*) definitely inferior to copper oxychloride; (*b*) doubtfully as effective; (*c*) equal in performance to it, including dichlone, organic fluosilicate No. 4, ferbam, ziram, verdet plus potassium permanganate, copper oxychloride with sulphur, copper hydroxyquinolate, copper, zinc, calcium, and cadmium chromates, copper-zinc chromate, B. 662 ZP, quaternary ammonium I, and copper ammonium fluoride; and (*d*) superior

to copper oxychloride, exemplified by copper oxide and zinc coposil, both in white oil. The possibility that the white oil might itself have been responsible for the fungicidal effect in the last group [see preceding abstract] was examined further. The first, second, third and fourth opened leaves were sprayed with oil, or oil plus copper oxychloride, or copper oxychloride in aqueous solution, or were left untreated. On the youngest leaves oil with or without copper oxychloride gave significantly more protection than the aqueous solution; on the second and third leaves the aqueous solution gave no significant protection whereas both oil treatments were only slightly less effective than on the first; and on the fourth leaves the aqueous solution afforded no protection while the oil treatments were still effective, though less so. As these latter were five to six weeks old and already infected when treated the action of the oil evidently inhibited rather than prevented infection. The action of the oil treatments in protecting young leaves against infection and suppressing spot development in older leaves already ten per cent. spotted was further investigated by treating both surfaces or one only. With young leaves both oil treatments gave significant protection when applied to the lower surface, as did aqueous copper, though significantly less than the oil treatments. None of the treatments was effective when applied to the upper surface. On the older, infected leaves the aqueous solution retarded spot development very slightly whichever surface was sprayed, but both oil treatments clearly suppressed spot development, most effectively when applied to the lower surface. However, although in this experiment the oil alone was as effective as with fungicide, the author considers that further trials should be carried out.

Adsuar (J.). **Transmission of Cucumber mosaic (Cucumber virus 9) found in Puerto Rico to Carica papaya.**—*J. Agric. Univ. P.R.*, 40, 2, pp. 125–126, 1956.

At the University of Puerto Rico cucumber virus 9 (cucumber mosaic virus: *Techn. Pap. P.R. agric. Exp. Sta.* 6, 1950) was transmitted from infected cucumber seedlings to three out of nine papaw plants inoculated by rubbing with carborundum. The infected papaws developed leaf symptoms characteristic of papaw mosaic virus as described by Adsuar [26, p. 458]. Re-transmission of the virus from papaw to cucumber could not be effected.

Laloraya (M. M.), Govindjee (R. V.), & Rajarao (I.). **Increased formation of asparagine in 'Carica-curl' virus infected leaves.**—*Experientia*, 12, 2, pp. 58–59, 1 fig., 1956.

The results of comparative paper-chromatographic analyses at the Department of Botany, University of Allahabad, India, of healthy papaw leaves and those infected by leaf curl virus [26, p. 20] revealed a marked increase of asparagine in the latter [cf. 35, p. 743].

Mathur (P. B.) & Subramanyam (H.). **Effect of a fungicidal wax coating on the storage behaviour of Mangoes.**—*J. Sci. Food Agric.*, 7, 10, pp. 673–676, 2 graphs, 1956.

At the Central Food Technological Research Institute, Mysore, India, Badami (Alphonso) mangoes were dipped in 1·7 to 2·7 per cent. aqueous emulsions of a fungicidal wax containing 5 per cent. *o*-phenylphenol and stored at a temperature of 79° to 86° F. and 55 to 87 per cent. relative humidity after drying in a current of hot air. The treatment was shown, among other improvements, to reduce the percentage of wastage due to [unspecified] diseases and prolong the storage life of the fruits by about 50 per cent.

Séchet (M.). **Note sur l'existence de formes parfaites dans le cycle des Pestalozzia de certains arbres fruitiers.** [Note on the existence of perfect forms in the cycle of *Pestalotia* spp. on fruit trees.]—*Fruits d'outre mer*, 10, 7, pp. 276–277, 1 fig., 1955.

A species of *Pestalotia* found on mango leaves [cf. 35, p. 378] near Farafangana, Madagascar, is probably the same as the one previously described [34, p. 659] though the spores are smaller, viz., —17·6 to 25·9 by 5 to 7·1 (average 19·6 by 6·4) μ. After some days in a moist chamber the host leaves developed perithecia of *Calonectria mangiferae* [loc. cit.].

A different *Pestalotia* with conidia measuring 17·6 to 26·4 by 7·9 to 10·6 (average 22·6 by 9·2) μ, was discovered on guava leaves [cf. 33, p. 243]. Perithecia similar to those described above developed, though the ascospores were slightly larger (11 to 16 by 4 to 6 μ), but the species is not yet identified with *C. mangiferae*. One week after sowing various media with a suspension of these ascospores *Pestalotia* conidia, identical with those on the leaves, appeared on potato agar and sterilized guava leaves, which subsequently also produced brown cavities (pycnidia) surrounded by yellowish mycelium and containing brown, tricellular, straight or slightly curved spores 14·1 to 16·7 by 5·2 to 7·1 (average 15·4 by 6·3) μ, slightly constricted at the septa, referable to *Hendersonia*.

Fawcett (C. H.), Spencer (D. M.), & Wain (R. L.). **Investigations on fungicides. I. Fungicidal and systemic fungicidal activity in certain aryloxyalkanecarboxylic acids.**—*Ann. appl. Biol.*, 43, 4, pp. 553–568, 1955.

In studies at the Agricultural Research Council Unit on Plant Growth Substances and Systemic Fungicides, Wye College, University of London, four of 54 aryloxyalkanecarboxylic acids, examined as possible systemic fungicides [cf. 31, p. 249; 32, p. 491], produced negligible damage on broad bean seedlings, but conferred systemic fungicidal protection against *Botrytis fabae* and to tomatoes against *Alternaria solani*, and were studied in more detail. The direct fungicidal activity of 20 compounds was assessed against *B. fabae* and *Pythium ultimum* in plate cultures.

The petiole test devised by van Raalte (*Proc. 3rd int. Congr. Pl. Prot., Paris*, p. 76, 1952) for detecting systemic fungicidal activity, in which a segment of potato petiole is placed vertically on an agar plate inoculated with a spore suspension of *Penicillium italicum*, proved unsatisfactory, the compounds producing toxic effects on the tissue. It was, therefore, modified; tomato petioles of known age and *Aspergillus niger* were used, the test compound in an agar block being applied to the upper end of the segment. For broad beans the technique used at first was that of Crowdy and Wain [31, p. 249] with slight modifications; later, in a more critical examination of selected compounds, counts were made of abortive and progressive lesions on upper and lower leaflets. With tomato plants the procedure was based on Stubbs's method [32, p. 492].

No correlation between fungicidal and systemic fungicidal action towards *B. fabae* was established. The systemic fungicidal activity of α-phenoxy*iso*butyric and 2:4:6-trichlorophenoxyacetic acid in beans and of the latter compound in tomato plants depended on seasonal factors [cf. 32, pp. 491, 492], though this did not apply to 3-phenoxybutyric or 5-phenoxycaproic acid. None of the compounds at 10 p.p.m. suppressed mycelial growth of *B. fabae* or of *P. ultimum*, and even at 100 p.p.m. it was seldom inhibited completely, even by such systemically active compounds as α-phenoxy*iso*butyric acid. Although systemic fungicidal activity could not adequately be explained on the basis of fungicidal activity of the compound within the host tissues, Seeley, using chromatographic methods, has demonstrated at Wye that traces of certain phenoxyacids, e.g., phenoxyacetic acid, are present

in the leaves of tomato plants three days after supplying a solution to the roots.

Active compounds were also applied in lanolin to the bases of intact leaf petioles on growing tomato plants and after six hours 5 mm. segments cut from such petioles at various distances from the base were placed on plates inoculated with *A. niger*. In many instances, e.g., with 5 per cent. α-(2-chlorophenylthio)propionic acid, zones of inhibition of fungal growth appeared within 40 hours. In other experiments such segments cut from the treated petioles were stood vertically for 24 hours, with cylinders of agar on top. When the cylinders were removed to seeded plates, they gave larger zones of effect than the treated segments themselves. Segments up to 4 cm. from the application site possessed fungicidal activity within three hours of treatment, with maximum activity after about six hours.

Bennett (S. H.) & Furmidge (C. G. L.). **Impression methods for the study of the distribution of deposits and organisms on plant surfaces.**—*Nature, Lond.*, 178, 4525, pp. 152–153, 4 figs., 1956.

At Long Ashton Research Station, Bristol, methods described by D. J. Crisp and W. H. Thorpe (*Nature, Lond.*, 165, p. 273, 1950) and by H. C. Bryson (*Lab. Pract.*, 3, p. 377, 1954) for obtaining transparent impressions of surfaces in gelatin and cellulose acetate, respectively, were applied to deposits on leaf surfaces. The leaf to be examined was pressed on a cellulose acetate film, 0·005 in. thick, previously moistened with a 5 per cent. solution of the film in acetone, left until hard (about one minute), and then peeled off. Gelatin impressions were obtained using glass slides coated with a 50 per cent. gelatin solution in water; these took about 30 minutes to set hard.

Almost all solid pesticide spray deposits on leaves and other plant material may be examined by one or other of these methods, those soluble in acetone being examined by the gelatin method, and water-soluble ones by the cellulose acetate technique.

Copper and lime-sulphur spray deposits are completely removed by cellulose acetate impressions and may be developed by treatment with a suitable chemical to produce a more highly coloured compound.

This method may be extended to other plant parts such as fruit or bark, which are best cut into strips before being used for surface impressions. It is also applicable to the study of the distribution and development of fungus spores, which can be stained with a suitable dye following removal on a cellulose acetate film.

Leben (C.), Tsao (P. H.), & Keitt (G. W.). **A small-scale field test for evaluating fungicides.**—*Phytopathology*, 46, 6, pp. 333–335, 1956.

The results of two years' application of a small-scale field test for the evaluation of fungicides in the control of tomato early blight (*Alternaria solani*) are reported from the Wisconsin Agricultural Experiment Station. Bonny Best seedlings were set in the field on an 8 by 8 ft. grid and staked. Beginning about a month after planting the plants were sprayed weekly for seven or eight weeks. Two to four days after each treatment the plants were sprayed at sunset with inoculum of chopped hyphae from synthetic liquid cultures. At various intervals and at the end of the season the amount of infection on each plant was rated by the Horsfall–Barrett method [25, p. 39].

In both years the weekly inoculations materially increased the incidence of the disease as compared with that resulting from natural infection—from 8 to 82 per cent. in 1954 and from 5 to 65 in 1955. The percentages of infection on the plants sprayed with copper A compound (4 lb. per 100 gals.), captan, maneb, and zineb (all at 2 lb.) in 1954 were 30, 14, 5, and 15, respectively, and in 1955 (based on the lower part of the plants only, as drought occurred), 7, 7, 7, and 5, respectively.

Oligomycin [34, p. 168] (1·66 lb.), used only in 1955, reduced the disease percentage from 65 to 13.

Advantages of this method of testing are the small area covered, 10 treatments being practicable in 50 by 80 ft.; the short time taken (three hours weekly); and the limited quantities of test fungicides needed. A drawback is the lack of significant data on fields, but nevertheless the procedure is thought to provide a useful link between the laboratory and the farm.

Johnson (D. P.). **Colorimetric determination of chloranil in fungicide preparations.** —*J. Ass. off. agric. Chem., Wash.*, 38, 4, pp. 946–949, 1 graph, 1955.

From the Analytical Division, North Carolina Department of Agriculture, a colorimetric method is proposed for the analysis of fungicidal mixtures containing spergon (chloranil) as the active ingredient. The reagents used are 20 gm. sodium hydroxide (pellets) in 1 l. water; 40 ml. glacial acetic acid in 100 ml. water; and 'spergon technical' purified by two recrystallizations from acetic acid, and diluted with benzene. The mixture is swirled for exactly 15 seconds, and then acidified; the light transmittance of the resulting solution is read in a spectrophotometer at a wave-length of 545 mμ. A standard curve is then prepared from known quantities of spergon.

Medvedev (M. M.). Действие на семена препарата НИУИФ–2. [The effect on seeds of the preparation NIUIF-2.]—Сад и Огород [*Orchard & Garden*], *1956*, 3, p. 89, 1956.

Experiments at the Crimean Experiment Selection Station, Krasnodar Territory, U.S.S.R., showed that NIUIF–2 [30, p. 563] has no deleterious effect on seed germination even after 18 months, thus refuting the earlier suggestion that seeds should be treated just before sowing or not longer than two to three months earlier.

Beaumont (A.). **Diseases of garden plants.**—152 pp., 16 pl., 16 figs., London, W. H. & L. Collingridge, Ltd., 1956. 25*s.* net.

This useful book gives brief descriptions of the diseases which the gardener is likely to encounter, together with concise indications for their control. Following short general chapters on symptoms and control measures there are separate chapters on the diseases of potatoes; other vegetables; annual flowering plants; perennial flowering plants; bulb, corm, and tuber plants; ornamental trees and shrubs; lawns; orchard fruit; and soft fruit. The illustrations include 63 black and white photographs and 16 line drawings of fungus spore forms.

Padwick (G. W.). **Losses caused by plant diseases in the colonies.**—*Phytopath. Pap. Commonw. Mycol. Inst.* 1, 60 pp., 10 pl., 6 graphs, 1 map, 1956. 10*s.*

This comprehensive publication deals with the many factors to be considered in estimating the losses and assessing the damage to crops caused by plant diseases [cf. 33, p. 41; 35, p. 208] in British Colonies, based on data, which are set out, for the most important permanent and semi-permanent crops, vegetatively propagated ones, and seed crops. An appendix tabulates the areas under different crops in each country, the diseases that affect them, and the category (over 10 per cent.; under, but still important; and small, or very small) into which the losses fall. These include hitherto unpublished data collected by the Colonial Plant Disease Survey. The average loss of all the crop groups considered is reckoned at 11·8 per cent. There is a bibliography of over four pages.

Baldwin (M. M.) & Chester (K. S.). **The literature on plant pathology.**—*J. agric. Food Chem.*, 4, 6, pp. 562–563, 1956.

The authors list and discuss, for the guidance of research workers, especially

chemists, a number of American and foreign text and reference books, technical, trade, and abstracting journals, and State and Federal Government publications dealing with plant pathology.

Wheeler (H. E.). **Sexual versus asexual reproduction in Glomerella.**—*Mycologia*, 48, 3, pp. 349–353, 1 fig., 1956.

In studies conducted at the Department of Botany, Louisiana State University, Baton Rouge, on several different perithecial and conidial cultures of *Glomerella cingulata*, all derived from a single isolate from wild *Ipomoea* [25, p. 407; 35, p. 311], it was found that the wild-type gene A^+ carried by perithecial strains controls perithecial production. In matings of A^+ and A^1 (conidial) cultures some perithecia developed that yielded A^1 cultures only, though perithecial fundaments were observed on A^1 mycelium, indicating that the A^+ allele controls the synthesis of some substance stimulating perithecial formation. Suppression of conidial production occurred in matings of A^+ and A^1 and with filtrates of A^+ cultures, while stimulation of conidial production was induced by A^1 filtrates [cf. 29, p. 488].

Buxton (E. W.). **Heterokaryosis and parasexual recombination in pathogenic strains of Fusarium oxysporum.**—*J. gen. Microbiol.*, 15, 1, pp. 133–139, 1956.

Most of the results of these experiments at Rothamsted Experimental Station on the occurrence of heterokaryosis in *Fusarium oxysporum* f. *pisi* and its possible influence on change in pathogenicity to peas have already been noticed [35, p. 871]. Addition of nutrients to the soil near the roots of inoculated plants restored the pathogenicity of two of the mutants to some 80 per cent. of that of the wild type, but injection into the stem 2 cm. above soil-level restored it to 60 per cent. only.

Kilpatrick (R. A.) & Johnson (H. W.). **Spray gun for greenhouse inoculations.**—*Phytopathology*, 46, 6, pp. 345–346, 1 fig., 1956.

An inexpensive new type of spray gun, supplied by A. Schrader's Son, Brooklyn 38, New York, was tested for fungal and bacterial inoculations in the course of investigations on soy-bean diseases at the Delta Branch Agricultural Experiment Station, Stoneville, Mississippi. It is a complete spray unit connected to an air line operating at 15 to 20 lb. pressure. There is a trigger-like attachment at the rear to permit the passage of air, and between this and the nozzle is a 'water' intake tube with a removable valve core which will take suspensions of different densities. In operation a 6- to 10-in. length of rubber tubing is attached to this, connecting to a flask or beaker with the inoculum. The end portion is easily changed if more than one organism is to be inoculated, the spray tip being adjustable for suspensions of different density. The gun is readily operated by one hand.

Wilhelm (S.). **A sand-culture technique for the isolation of fungi associated with roots.**—*Phytopathology*, 46, 5, pp. 293–295, 1 fig., 1956.

At the Department of Plant Pathology, University of California, Berkeley, roots of *Solanum sarachoides*, a weed of strawberry fields in the central coastal areas of the State, were immersed in 0·1 per cent. mercuric chloride for 1½ to 2 minutes, rinsed, and incubated in coarse, sterile, moist sand in Petri dishes covered with tops containing a layer of 2 per cent. water agar to prevent moisture loss. They were transferred two to four weeks later to dishes of sterile water and examined under the dissecting microscope. Fungal structures identified included microsclerotia of the strawberry pathogen, *Verticillium albo-atrum* [35, p. 450]; sclerotia of *Colletotrichum atramentarium* and resting bodies of *Pyrenochaeta terrestris* parasitic in inoculation tests on onion and strawberry; oospores of *Pythium ultimum*, which caused damping-off of tomato; a grey, sterile fungus pathogenic to strawberry; sclerotia of *Macrophomina phaseoli*, hyphal strands of *Rhizoctonia* [*Corticium*]

solani, chlamydospore clumps of *Fusarium roseum*, and pycnidia of a dark-coloured *Phoma* sp. Some of these were innocuous to *S. sarachoides*.

Carmichael (J. W.). **The cellophane technique for studying morphology and hyphal fusions in fungi.**—*Mycologia*, 48, 3, pp. 450–453, 1956.

A simple form of the cellophane technique [cf. 35, p. 697] was found to be particularly useful for studying the growth of easily fragmented, yeast-like fungi and for observing hyphal fusions at the Provincial Laboratory of Public Health, University of Alberta, Edmonton. Small, sterile squares of cellophane (15 to 18 mm.) for mounting under 22 mm. cover glasses are placed on the surface of a solid culture medium, and the fungus is inoculated on top. For permanent mounts the cellophane is placed, colony side up, on a drop of lacto-fuchsin or lactophenol on a slide. The surface growth may then be wetted with 70 per cent. alcohol and a second drop of lacto-fuchsin and a cover glass placed on top.

Carmichael (J. W.). **Frozen storage for stock cultures of fungi.**—*Mycologia*, 48, 3, pp. 378–381, 1956.

At the Provincial Laboratory of Public Health, University of Alberta, Edmonton, very promising results were obtained when 400 fully grown stock cultures of fungi on Sabouraud's agar in screw-capped tubes were stored in cardboard boxes at −20° C. Viability was generally well maintained over a period of nine months, 17 being lost, and long-term tests are now in progress.

Covert (S. V.). **Colony mounts of fungi.**—*Mycologia*, 48, 3, pp. 448–450, 1 fig., 1956.

A method of mounting a small complete fungal colony with a minimum of handling is described. Petri dishes containing a thin layer of suitable medium are spot-inoculated, and at the proper stage of growth a block of agar containing the whole colony is cut out, placed growth-side down on a cover glass, and a drop of 10 per cent. formalin is added. When the formalin has diffused into the agar, the excess is removed and the block is placed on a slide. The space between the overhang of the coverslip and the slide is filled with permount (a mounting medium: the Fisher Scientific Company). Blocks stained with lactophenol have been similarly prepared.

Hirata (K.). **On the low and ununiform germinability in conidia of the powdery mildew.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 61–64, 1 fig., 1954. [Japanese.]

This is a survey of published reports on the germinative capacities of conidia of the powdery mildews [Erysiphaceae: 25, p. 280 *et passim*].

Pohjakallio (O.), Salonen (A.), Ruokola (Anna-Liisa), & Ikäheimo (K.). **On a mucous mould fungus, Acrostalagmus roseus Bainier, as antagonist to some plant pathogens.**—*Acta Agric. scand.*, 6, 2, pp. 178–194, 9 figs., 1956.

In studies at the Department of Plant Pathology, University of Finland, Helsinki, of micro-organisms capable of antagonizing the clover rot fungus (*Sclerotinia trifoliorum*) [32, p. 435], one of the fungi isolated from the sclerotia of *S. trifoliorum* was *Acrostalagmus roseus* [*Verticillium roseum*]. This was able to parasitize and destroy the sclerotia of *S. sclerotiorum* [see above, p. 7], *S. borealis*, *Botrytis cinerea*, and *Claviceps purpurea*, even when they were placed on the surface of field soil. Both *V. roseum* and *S. trifoliorum* could infect clover from field soil, the former being able to parasitize weakened red clover plants. On nutrient agar it had an antibiotic effect on *S. trifoliorum*. On sterilized substrates it competed with *S. trifoliorum* and *S. borealis* at room temperature, but could not grow at low temperatures

(−1·6° to 6·5° C.). When mixed with unsterilized soil it did not prevent infection by *S. trifoliorum*. On clover plants and tomato fruits it was inhibited by *B. cinerea* and other fungi.

Aitken (R. A.), Eddy (B. P.), Ingram (M.), & Weurman (C.). **The action of culture filtrates of the fungus Myrothecium verrucaria on β-glucosans.**—*Biochem. J.*, 64, 1, pp. 63–70, 1 diag., 5 graphs, 1956.

It is reported in this joint contribution from the Low Temperature Station for Research in Biochemistry and Biophysics, University of Cambridge, and the Department of Scientific and Industrial Research that cell-free mineral salt solution culture filtrates of *Myrothecium verrucaria* contain a cellulase [34, p. 239], partially inactivated by 10 minutes' heating at 60° C., sometimes with cellobiase, completely inactivated by the same treatment, or in the absence of cellobiase possibly transglycosidase (totally destroyed).

Besides β-1:4-glucosidases, culture filtrates of *M. verrucaria* contain β-1:3-glucosidases, hydrolysing laminarin and laminarinibiose. When these glucosidases act together on barley β-glucosan, cellobiose, laminaribiose, and glucose are produced.

Abrams (E.) & Bottoms (R. R.). **A copper process for prolonged microbiological protection of cellulosic fabrics by chemical modification.**—*Text. Res. J.*, 26, 8, pp. 630–640, 1956.

A new process was developed and tested for more than six years at the Southern Research Institute, Birmingham, Alabama. which confers protracted resistance to [unspecified] mildew on cellulose materials, including cotton, rayon, and other textiles. It consists essentially in treatment with a dilute solution (0·45 to 0·8 per cent.) of copper formate, followed by 30 minutes' autoclaving at 120° C., during which the compound is converted, at least in part, to copper oxide. Samples of cotton fabric treated by this method proved resistant to pure cultures of *Chaetomium globosum* both before and after exposure to the 'weather-ometer' [cf. 24, p. 380] and survived upwards of two months' soil burial without loss of breaking strength, up to 95 per cent. of which was, in fact, retained even after a year. It is postulated that in fabrics so treated the copper is bound to the cellulose, producing the effect of cross-linking. The treated material was only very slightly soluble in cuprammonium and cupriethylene diamine.

Ross (S. H.), Rosenwasser (E. S.), & Teitell (L.). **Effects of fungi on barriers.**—*Mod. Packag.*, 29, 10, pp. 180–184, 237–238, 241, 3 figs., 1956.

At the Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, Pennsylvania, samples of paper-asphalt laminates, paper or cotton laminated or coated with polyethylene, and metal foil laminated with polyethylene and cotton, used as water barriers, were exposed to fungal attack by four laboratory methods, i.e., three weeks on nutrient salts agar; suspension in jars at a temperature of 29°±1° C. and 100 per cent. relative humidity for 12 weeks; the same period in a simulated tropical atmosphere maintained for 20 hours at 95 per cent. relative humidity and 85° F., followed by four at 100 per cent. and 79°; and burial for up to four months in beds of humus, top soil, and sand (equal parts), with a moisture content of 30 per cent. of the dry weight. The fungi used for inoculation were *Chaetomium globosum*, *Aspergillus flavus*, *A. niger*, *A. versicolor*, *Trichoderma* sp., and *Myrothecium verrucaria*.

The paper-asphalt barriers suffered severe degradation [27, p. 253], with a total loss of water resistance and considerable reduction in breaking strength. The polyethylene-laminated or -coated materials decreased appreciably in breaking strength but retained their water resistance, and the same effects were produced

on aluminium foil laminated with polyethylene and cotton scrim. The incorporation of copper pentachlorophenate (0·25 to 0·3 per cent. copper) in polyethylene-coated paper prevented fungal infection and reduced loss of breaking strength to a tolerable limit.

Middleton (J. T.), Crafts (A. S.), Brewer (R. F.), & Taylor (O. C.). **Plant damage by air pollution.**—*Calif. Agric.*, 10, 6, pp. 9–12, 16 figs. (15 col.), 1956.

In the Los Angeles area visible injury to 11 crops, including ornamentals, by polluted air [cf. 30, p. 207; 35, pp. 533, and next abstract] has caused damage estimated at 3,000,000 dollars annually since 1953. Ethylene, fluorides, herbicides, oxidized hydrocarbons ('smog'), ozone, and sulphur dioxide are responsible for most plant damage.

Ethylene at 10 parts per 100,000,000 causes leaf abnormality in tomato, and also damage to ornamentals, which is described. Controlled fumigation of gladiolus and vine with hydrogen fluoride at concentrations less than 10 parts per 1,000,000,000 produced die-back from the tip in gladiolus leaves and marginal necrosis and discoloration in vine, symptoms indistinguishable from those seen on these plants near industrial sources of fluoride contamination. Citrus was less susceptible. Careless use of herbicides has caused losses in many crops.

Damage caused by oxidized hydrocarbons takes the form of silvering and glazing of the lower leaf surfaces in a number of ornamental plants and field crops, sometimes followed by a bronze or reddish discoloration. Cereals [cf. 32, p. 478] develop chlorotic blotched and streaked areas. Lucerne is very sensitive, and the leaves may be killed. The effect on different citrus varieties [35, p. 98] is described. Ozone causes bleaching, chlorosis, and sometimes collapse of leaves, without glazing, silvering, or bronzing of the lower surface. Sulphur dioxide causes collapse, desiccation, and bleaching of the interveinal tissues of leaves in a short time, the veins remaining green, or at lower concentrations may produce chlorotic markings only.

Kendrick (J. B.), Darley (E. F.), Middleton (J. T.), & Paulus (A. O.). **Plant response to polluted air.**—*Calif. Agric.*, 10, 8, pp. 9–10, 15, 1 fig., 1 map, 1956.

In further observations on this subject [see preceding abstract] the authors give numerous examples to show that the response of a crop to polluted air may depend on variety, soil fertility and moisture, and air temperature. Fungicides of the dithiocarbamate, benzothiazole, and thiuramsulphide groups afforded protection to plants exposed to fumes of oxidized hydrocarbons, the degree of protection being related to the cover achieved on the lower leaf surfaces and to the amount of active ingredient in the preparation in question. Field trials are in progress to test whether 'smog' damage may be controlled by spraying. Passage of polluted air through activated carbon filters has been successfully employed in several glasshouses. A State survey of symptoms in 40 field and glasshouse crops and eight sensitive weeds allowed the main agents of pollution to be graded in decreasing order of importance: oxidized hydrocarbons ('smog'), ethylene, fluorides, and sulphur dioxide. An accompanying table sets out the crops that are susceptible and those that are resistant to air pollution.

Kuć (J.), Henze (R. E.), Ullstrup (A. J.), & Quackenbush (F. W.). **Chlorogenic and caffeic acids as fungistatic agents produced by Potatoes in response to inoculation with Helminthosporium carbonum.**—*J. Amer. chem. Soc.*, 78, 13, pp. 3123–3125, 1 diag., 1 graph, 1956.

At Purdue University, Lafayette, Indiana, two compounds fungistatic to *Helminthosporium carbonum* were separated by chromatography from extracts of Idaho-grown Netted Gem potato peel and pulp tissue on which the fungus made only limited growth [35, p. 382]. The physical and chemical properties of the

compounds agreed with those of chlorogenic and caffeic acids [cf. 34, p. 541], which are presumed to be closely associated with natural immunity from *H. carbonum* in potato.

Pramer (D.), Robison (R. S.), & Starkey (R. L.). **The mode of action of antibiotics in the control of plant disease.**—*Phytopathology*, 46, 6, pp. 341–342, 1 diag., 1956.

After indicating that the control of plant diseases by antibiotics may be due to their direct action on the pathogen, its toxins, or the host, or may be brought about by their transformation in the plant, or by a combination of these, the authors describe experiments at New Jersey Agricultural Experiment Station comparing the indirect action of antibiotics in the inhibition of crown gall [*Agrobacterium tumefaciens*: 35, p. 513] with their inhibition of *Erwinia chrysanthemi* [35, p. 456]. Use of antibiotic-resistant and -sensitive strains of *E. chrysanthemi* resulted in infection only by resistant strains, indicating that the antibiotic in this instance acts directly on the organism.

Müller (K. O.). **Einige einfache Versuche zum Nachweis von Phytoalexinen.** [Some simple tests for the demonstration of phytoalexins.]—*Phytopath. Z.*, 27, 3, pp. 237–254, 3 figs., 2 graphs, 1956. [English summary.]

A method is reported from the Division of Plant Industry, Canberra, for the ready demonstration of the post-infectional development of antibiotic factors ('phytoalexins') in hypersensitive host tissues, such as those of potato in relation to *Phytophthora infestans* [19, p. 490]. The results are to be published *in extenso* in an Australian journal.

The procedure involves the separation of the antibiotic principle from the reacting host tissue by diffusion and semi-quantitative bioassays of the antibiotic activity of the diffusates. The use of *Sclerotinia fructicola* and *Phytophthora infestans* on the inner epidermis of bean (*Phaseolus vulgaris*) pods yielded the following results. At 20° C. and within eight hours of invasion by the parasite the presence of antibiotic factors could be detected in diffusates from the reactive tissues. The fungicidal principle was shown to originate from an interaction between the living host tissue and the fungus. During this process a substance appears which also exerts a toxic effect on the plant cells, thereby explaining the death of both host and parasite. The antibiotic action of the crude diffusates was found to be non-specific.

Crude preparations of the principle are active over a wide range of pH, temperature, and nutrient conditions and it is dialysable. Its activity is not impaired by maintenance at subfreezing temperatures for three months; heating to 100° appears to enhance the toxicity of the diffusates, which contain at least two antibiotic components.

Tichý (V.). **Podíl kyseliny usninové na fungistatických vlastnostech lišejníku Usnea hirta Hoffm. Studie o povoze lišejnikových antibiotik.** [Participation of acetic acid in the fungistatic properties of the lichen *Usnea hirta* Hoffm. Studies on the nature of lichen antibiotics.]—*Publ. Fac. Sci. Univ. Masaryk* 364, 12 pp., 2 graphs, 1955. [Russian and French summaries.]

Studies at Brno, Czechoslovakia, revealed the fungistatic effect of the lichen *Usnea hirta* and of acetic acid on the wood-rotting fungi *Poria vaillantii*, *Merulius lacrymans*, *Schizophyllum commune*, *Gloeophyllum sepiarium* [*Lenzites saepiaria*], *Fomes marginatus*, and *F. annosus*. Acetic acid at the concentrations used in these experiments (2·5 to 4 per cent.) could not inhibit fungal growth completely. It is therefore regarded as only partially responsible for the fungistatic action, which also depends on other products of lichen metabolism.

Dominik (T.), Nespiak (A.), & Pachlewski (R.). **Badanie mykotrofizmu zespołów roślinnych regla górnego w Tatrach.** [An observation on mycotrophy in the plant associations of the highest Spruce forests of the Tatra range.]—*Acta Soc. Bot. Polon.*, 23, 3, pp. 487–504, 7 figs., 1954. [German summary.]

The results are presented of investigations on the mycotrophy of the associations of ordinary spruce forest on limestone and of *Vaccinium myrtillus* on granite soils [cf. 32, p. 688 and next abstract]. About 75 per cent. of the species proved to be mycotrophic, mycotrophy decreasing with increasing density of the stand. When illumination in the more open stands of the higher sites is increased mycotrophy may reach 100 per cent. Ectotrophic mycorrhiza of the A type were most commonly found in spruce.

Dominik (T.), Nespiak (A.), & Pachlewski (R.). **Badanie mykotrofizmu róslinności zespołów na skałkach wapiennych w Tatrach.** [A study on mycotrophy of plant associations on limestone in the Tatra range.]—*Acta Soc. Bot. Polon.*, 23, 3, pp. 471–485, 5 figs., 1954. [German summary.]

Studies of plant associations growing on soil above limestone in the High Tatra, Poland [see preceding abstract], showed that the pH range of 5 to 7·5 does not influence the mycotrophy in these associations and that the lower the altitude the greater is its development. Under wood shade conditions mycotrophy is less sharply developed, and though trees exhibit the normal level, in herbaceous plants below them there is less than outside the wood. Plants may be distinguished which are always mycotrophic or always autotrophic, irrespective of the association in which they grow, and others which may alternate. When mycotrophic, the latter may develop various types of mycorrhiza depending on the make-up of the association, including fungi, of which the amount found associated with the roots varies greatly.

Pryor (L. D.). **Chlorosis and lack of vigour in seedlings of renantherous species of Eucalyptus caused by lack of mycorrhiza.**—*Proc. Linn. Soc. N.S.W.*, 81, 1, pp. 91–96, 1 pl., 1 fig., 1956.

This account of the formation of ectotrophic mycorrhiza with *Scleroderma flavidum* in members of the Renantherae of *Eucalyptus* has already been noticed from another source [35, p. 477].

Bachmann (E.). **Der Einfluß von Fusarinsäure auf die Wasserpermeabilität von pflanzlichen Protoplasten.** [The influence of fusarinic acid on the permeability of plant protoplasts to water.]—*Phytopath. Z.*, 27, 3, pp. 255–288, 23 graphs, 1956.

The mode of action of the wilt toxin fusarinic acid [cf. 35, pp. 386, 727] was studied in plasmometric experiments on *Spirogyra* and the pigmented lower epidermis of the flowering plant *Rhoeo*. The test material was subjected to the action of the toxin for 30 minutes and lightly dried on filter paper before transference to the plasmolysing solution (0·8 molar saccharose for *Spirogyra*; 0·3 molar mannitol for *Rhoeo*) for thirty minutes, after which plasmolysis was complete. Any change of permeability in the protoplasm was measured in terms of increase or decrease in the time required for deplasmolysis, as compared with controls. Serial concentrations of fusarinic acid, pyridine, and derivatives of pyridine resembling fusarinic acid were studied by this method.

Fusarinic acid produced irreversible changes of permeability in both plants, and from observations on the other compounds it was concluded that the pyridine ring, common to all, was responsible for increasing permeability. In *Rhoeo* the disturbance of permeability was attributable to impaired non-osmotic water uptake

and it was demonstrated that this was caused by interference with oxidative phosphorylation and with the cytochrome oxidase mechanism.

Nonaka (F.). **Accumulation of radioactive phosphorus-32 in the lesions of some diseased plants.**—*Proc. Ass. Pl. Prot. Kyushu*, 1, pp. 36–39, 6 figs., 1955. [Japanese, with English summary. Received 1956.]

At the Laboratory of Plant Pathology, Kyushu University, Japan, radioactive phosphorus (P^{32}) [35, p. 852] was found to accumulate round the lesions of tobacco anthracnose (*Colletotrichum* sp.) [?*C. tabacum*], rice leaf spot (*Ophiobolus miyabeanus*), and beet leaf spot (*Cercospora beticola*) in detached leaves. No accumulation was observed round the lesions of sweet potato leaf spot (*Phyllosticta batatas*), rice bacterial [leaf] blight (*Xanthomonas oryzae*), or rice stem rot (*Helminthosporium sigmoideum* [*Leptosphaeria salvinii*]).

Carlile (M. J.). **A study of the factors influencing non-genetic variation in a strain of Fusarium oxysporum.**—*J. gen. Microbiol.*, 14, 3, pp. 643–654, 1956.

Investigations at the Botany School, Cambridge, on the effect of varying environmental factors, particularly light and nutrition, on a strain of *Fusarium oxysporum* isolated from a gladiolus corm, showed that colour variation was dependent on the production of carotenoids and naphthoquinones [cf. 35, p. 297]. Carotenoids and macrospores were both produced in daylight as a result of photoactivation, but required different wave-lengths. The production of napthoquinones could occur in the dark, and was dependent upon the carbon-nitrogen ratio and the presence of high glucose concentrations in the medium. A low carbon-nitrogen ratio favoured the formation of chlamydospores and aerial mycelium, while ultraviolet radiation, and to some extent light, promoted the production of both macrospores and sclerotia.

De Meester-Manger Cats (V.). **Solanum dulcamara (Bitterzoet) als mogelijke bron voor bladrolvirus.** [*Solanum dulcamara* (Bittersweet) as a potential source of leaf roll virus.]—*Tijdschr. PlZiekt.*, 62, 4, pp. 171–173, 1956. [English summary.]

Plants of *Solanum dulcamara* were collected in 25 localities in Holland and tested for the presence of potato leaf roll virus [13, p. 49] by allowing virus-free adults of *Myzus persicae* to feed on them for 24 hours and then transferring the aphids in groups of 10 to seedlings of *Physalis floridana* [see next abstract]. After about three weeks many of the test plants developed the interveinal chlorosis characteristic of leaf roll, indicating that *S. dulcamara* is a carrier of the virus though showing no symptoms itself. Moreover, seedlings of the weed grown from seed from an infected plant also remained symptom-free both before and after colonization with *M. persicae*. The virus was also successfully transmitted by grafting *S. dulcamara* on Bintje potato and by means of the aphid from the former to the latter host.

The disease was also shown to be seed-borne in *S. dulcamara* and since the leaf roll virus is apparently non-pathogenic to the plant it may well be a natural, integral component of it.

De Meester-Manger Cats (V.). **Korte overdrachttijd van bladrolvirus.** [A short transmission period of leaf roll virus.]—*Tijdschr. PlZiekt.*, 62, 4, pp. 174–176, 1956. [English summary.]

In experiments at the Phytopathological Research Institute, Wageningen, Holland, an acquisition period of 15 minutes on *Physalis floridana* plants infected by potato leaf roll virus, followed by 15 minutes' inoculation on the same host, sufficed for the transmission of the virus by groups of five initially virus-free, non-fasting *Myzus persicae* [see preceding abstract], 31 out of 45 healthy seedlings

contracting the disease. When potato was used as the virus source 11 out of the 18 *P. floridana* plants inoculated by the same method developed leaf roll.

KLOOSTERMAN (E. G.). **De invloed van de bladrolziekte op de opbrengst van de Aardappel.** [The influence of the leaf roll disease on the Potato yield.]—*Tijdschr. PlZiekt.*, 62, 4, pp. 157–166, 1 graph, 1956. [English summary.]

This is an expanded, tabulated account of experiments to determine the influence on potato yields of infection by the leaf roll virus in Holland [see preceding abstracts], a preliminary note on which has already appeared [34, p. 474].

FINK (H. C.). **Vapam and P.C.N.B. soil treatments for Potato scab control.**—*Plant Dis. Reptr*, 40, 3, pp. 190–192, 1 fig., 1956.

Pentachloronitrobenzene (25, 50, 75, and 100 lb. per acre) and vapam (sodium-N-methyl dithiocarbamate, dehydrate, 25, 50, and 100 lb.) effectively controlled potato scab (*Streptomyces* [*Actinomyces*] *scabies*) [35, pp. 630, 709] in a field experiment conducted by the Botany and Plant Pathology Department, Pennsylvania State University, University Park. The solutions were sprayed on the soil one week after inoculation and two weeks before planting, disked in, and a water seal was applied. With pentachloronitrobenzene the degree of control tended to decrease with increased rate of application, the average severity of the disease based on the percentage area of tuber surface with deep scab ranging from 24 to 36 as against 48·3 for potatoes growing in untreated soil. With vapam the trend was reversed (19·6 to 10·3).

REINDEL (F.) & BIENENFELD (W.). **Unterschiede in der qualitativen Zusammensetzung der Proteine und Peptide von Blattpreßsäften gesunder und rollviruskranker Kartoffelpflanzen. Unterschiede in den freien Aminosäuren in Blattpreßsäften gesunder und blattrollkranker Kartoffelpflanzen.** [Differences in the qualitative composition of the proteins and peptides of expressed leaf saps of healthy and roll virus diseased Potato plants. Differences in the free amino acids in expressed leaf saps of healthy and leaf roll diseased Potato plants.]—*Hoppe-Seyl. Z.*, 303, 4–6, pp. 262–271, 2 diags., 1 graph; 305, 2–3, pp. 123–131, 1 graph, 1956. [English summaries.]

At the Chemical Institute, Weihenstephan, Munich, Germany, seven nitrogenous compounds staining with benzidine were detected in the expressed leaf saps of seven-week-old healthy potato plants after separation by means of paper electrophoresis, while leaf roll virus-infected ones of the same age also harboured an eighth component, a homogeneous, phosphorus-containing oligopeptide. The eight constituent amino acids of the latter were identified by paper chromatography as asparaginic acid, glycine, glutaminic acid, threonine, adanine, valine, leucine, and a little methionine. Glycine was shown to be the terminal amino acid in the peptide chain.

Further paper-chromatographic studies revealed the same 22 free amino acids in both healthy and infected saps. Semi-quantitative analysis by determination of the ninhydrin-copper complexes of the acids demonstrated an increase in the glutamic acid and valine contents of diseased material. The increase in the former constituent is attributed in part to hydrolysis of glutamine, and was shown by analysis of the saps of plants supplied with S^{35} in the form of sulphate not to be caused by cleavage of glutathione.

SALZMANN (D. R.) & KELLER (E. R.). **Über Resistenz und Toleranz von Kartoffelsorten gegenüber Viruskrankheiten.** [Resistance to and tolerance of virus diseases in Potato varieties.]—*Mitt. schweiz. Landw.*, 4, 5, pp. 75–84, 6 figs., 1956.

This is a popular article on field degeneration of potato caused by virus diseases,

with definitions of tolerance, immunity, hypersensitivity, and other terms, illustrated by the results of field tests of a number of varieties at Zürich-Oerlikon, Switzerland, over the period 1949 to 1955 [35, p. 90 and next abstract].

Jacobi, Atlanta, and Ker Pondy showed good tolerance, while Virginia, Augusta, and Bella showed good resistance. The supply of inspected and guaranteed 'seed' in Switzerland amounts to about 40 per cent. of the total requirement.

Bode (O.) & Paul (H. L.). **Elektronmikroskopische Untersuchungen über Kartoffelviren. III. Vermessungen an Teilchen des Kartoffel-Y-Virus.** [Electron-microscopic studies on Potato viruses. III. Measurements of the particles of Potato virus Y.]—*Phytopath. Z.*, 27, 1, pp. 107–112, 1 fig., 2 graphs, 1956.

The electron-microscopic examination at the Institute for Agricultural Virus Research, Brunswick, Germany, of five strains of potato virus Y [cf. 35, p. 118] revealed morphologically uniform particles measuring approximately 759 by 12 mμ.

Broadbent (L.), Burt (P. E.), & Heathcote (G. D.). **The control of Potato virus diseases by insecticides.**—*Ann. appl. Biol.*, 44, 2, pp. 256–273, 1956.

Replicated trials were carried out at Rothamsted Experimental Station in 1950, 1951, 1953, and 1954 [cf. 35, p. 869] to determine whether the spread of leaf roll virus and virus Y in potato crops could be reduced by the application of insecticides. The results obtained each year are set out. Healthy crops of King Edward and Majestic potatoes were used, with a few infected tubers planted in each plot. Spraying was carried out, mostly at the rate of 100 gals. per acre per application, every 10 or 14 days, according to the stage of growth of the plants, with a tractor-mounted spraying-machine. Virus spread was estimated by growing tubers from the five plants on either side of each infector.

The results obtained showed that DDT emulsion (used in all trials), DDT suspension, endrin, schradan, mipafox, malathion, parathion, and systox prevented the spread of leaf roll virus [cf. 33, p. 549] and decreased that of virus Y. Dieldrin and toxaphene were ineffective. When virus control was achieved, aphid control was good. In these experiments the plants were kept protected by insecticide, as far as possible, by spraying seven to nine times. Whether fewer applications are effective and a spraying programme is an economic method of maintaining potato stocks will not be known until the results of other experiments in progress in different parts of England have been obtained.

Tests of the persistence of the products used (which is affected mainly by attenuation of the deposits through foliage growth, uptake by the foliage, and weathering) and aphid population counts indicated that in 1953 and 1954 all the insecticides, used at intervals of ten days up to crop maturity and 14 days thereafter, remained active as long as the crop was not making rapid growth; when growth was rapid, the systemic insecticides remained active longer than the contact insecticides. If aphid control during the early stages of crop growth proves to be important it may be best to apply a systemic insecticide early in the season and a contact insecticide later. A bibliography of 18 titles is appended.

Hebblethwaite (P.). **A colorimetric method for measuring dosage distribution in Potato spraying.**—*Plant Path.*, 5, 1, pp. 26–28, 1 fig. (between pp. 18 and 19), 1956.

At the National Institute of Agricultural Engineering, Silsoe, Bedfordshire, a colorimetric method was devised to estimate the spray deposit on both leaf surfaces of potato foliage sprayed against blight [*Phytophthora infestans*: cf. 25, p. 470], as opposed to micro-distribution, for which a leaf-printing technique is necessary [cf. 33, p. 376]. A black dye (nigrosine G. 140) was added to the spray fluid to give

½ to 2 per cent. concentration (the latter for low-volume application). Leaf samples were shaken in a standard volume of water and the resulting dye solution estimated colorimetrically with an absorptiometer (Unicam S.P. 400). Either the whole leaf was sampled, or more generally one-inch disks were cut from the centre, the simplest comparative method, though the deposit here may not be the same as that of the leaf as a whole. To estimate the deposit on one surface only, half the leaves sampled were painted on the other surface with a quick-drying rubber solution (dilute 'cow gum' from P. B. Cow and Co., Ltd.). The results obtained showed the great variation from leaf to leaf and the need for replicated sampling.

Clayson (Angela M.) & Robertson (N. F.). **Survival of Phytophthora infestans in Potato stem lesions.**—*Plant Path.*, 5, 1, pp. 30–31, 1 diag., 3 graphs, 1956.

Observations at the Botany School, Cambridge, in July and August, 1955, on the progress of potato blight (*Phytophthora infestans*) in individual inoculated plants in the field demonstrated that during exceptionally hot, dry weather the fungus can survive as viable mycelium in stem lesions for over 40 days [cf. 35, p. 871].

Potato blight forecasting and survey work in England and Wales, 1953–55.—*Plant Path.*, 5, 2, pp. 39–52, 1 diag., 3 graphs, 9 maps, 3 charts, 1956.

This report from the Conference of Plant Pathologists, National Agricultural Advisory Service, compiled by E. C. Large, summarizes the results of the second three years' work in England and Wales in the development of forecasting for maincrop outbreaks of potato blight [*Phytophthora infestans*: cf. 32, p. 585]. The evidence obtained confirmed earlier conclusions as to the value of the operations chart method if allowances are made for varying maturity of different crops.

Flushes of Beaumont periods in June (elsewhere than in Devonshire, Cornwall, and south-western and western Wales) are not in themselves sufficient to give rise to general outbreaks, except where maincrop potatoes are exceptionally forward and there have been earlier June flushes.

The 'outbreak' stage [loc. cit. and cf. 35, p. 319] is not likely to be reached until the fungus has passed through two or three generations in the season, and to select an earlier stage for forecasting would cause warnings to be premature [cf. 34, p. 393]. The outbreak dates shown on the yearly charts are for the first one or two fields in the area surrounding the station (and sometimes up to 25 miles away), usually planted earlier and therefore with denser crops, or more susceptible varieties. Other outbreaks occur later, generally over a fortnight or more. Good outbreak maps may indicate station performances better than the charts.

The area most difficult to forecast for accurately, especially in dry years, is the central midland and central southern inland region. This is partly due to the siting of some stations in relation to potato areas, but more particularly because low humidity may give more near-critical periods, with greater time to build up the two or three generations needed for an epidemic that may then ensue in sprawling crops, even after a dry July if August is humid, and especially if temperatures of 60° to 70° F. prevail.

Oort (A. J. P.). **New views and new results in the field of crop protection.**—*Phytiatrie-Phytopharm.* (numéro spécial), pp. 105–114, 1955.

In this lecture, presented at a series of European study sessions on the control of crop pests and diseases, held at Mondorf-les-Bains, Luxemburg, in September, 1955, a description is given of a storehouse designed in Holland to reduce the sprouting of stored potatoes by maintenance of low temperatures. The house is well insulated and kept cool by drawing in cold air through a ventilation system at night and closing the ventilators during the day. No air is drawn in on warm or frosty nights. Losses of the stored potatoes caused by *Phytophthora* [*infestans*], *Fusarium*,

and bacteria are much reduced. Similar houses provided with heaters may be used for onion storage, the onions being thoroughly dried by warm air (35° C. for 2 to 2½ days) to prevent rot (*Botrytis allii*) and then kept at a temperature just above zero.

The author also stressed the need for developing systemic fungicides, with special reference to seed disinfection, and reviewed some recent work in this field.

In a comment on this paper D. Price Jones (pp. 114–118) also emphasized the value of seed dressings, particularly combined insecticide-fungicides, and mentioned that a mercurial-lindane combination is now widely used on cereals in Europe and North America.

Llaveria (M.), Revilla (V.), & Sanchez (J. L.). **Hielo de la Papa en la sierra y su control.** [Potato blight in the highlands and its control.]—*Inf. Estac. agríc. La Molina* 95, 18 pp., 7 figs., 4 graphs, 1955. [English summary. Mimeographed.]

At Maco, in the Junín Department of Peru, four fungicides were tested against *Phytophthora infestans* [35, p. 537]. As against 12,880 kg. per ha. for the control, the yield under copernate 50 dust treatment was 21,312 kg., copper A compound spray 18,870 kg., parzate 15,890 kg., and praparat 4311 15,050 kg. It is concluded that dusting with metallic fungicides is desirable on grounds of both efficiency and cost.

Keller (E. R.). **Bericht über die Hauptversuche mit neuen Kartoffelsorten 1953–1955.** [Report on the main tests with new Potato varieties 1953–1955.]—*Mitt. schweiz. Landw.*, 4, 5, pp. 65–75, 1956.

Following routine field tests at six centres from 1953 to 1955 in comparison with standard varieties the potato varieties Augusta, Benedikta, and Maritta were incorporated in 1955 into the official Swiss standard assortment. All are immune from wart [*Synchytrium endobioticum*]. Augusta is a medium-early variety from a Bona-Sämling cross possessing some resistance to blight (*Phytophthora* [*infestans*]), and showing considerable resistance to and tolerance of virus diseases [see above, p. 53]. It stores fairly well. Benedikta is a medium-late, rapidly maturing variety from an Aquila-Sämling cross, not particularly susceptible to blight on the haulms, though more so to tuber rot, and possessing moderate resistance to virus diseases. Internal rust occurs. The variety stores well. Maritta is a medium-late, rapidly maturing variety from a Weihenstephaner Sämling-Mittelfrüh cross, moderately susceptible to haulm blight, though the tubers are more resistant, and moderately resistant to virus diseases, being more affected by leaf roll than by streak and severe mosaic [potato virus Y]. In tests all proved susceptible to viruses X and A except Benedikta, which was hypersensitive to A.

Mirzabekyan (R. O.) & Sinitsuina (Mme N. V.). Действие культур актиномицетов на зимующие спорангии возбудителя рака Картофеля. [The effect of actinomycete cultures on the overwintering sporangia of the causal agent of Potato canker.]—Агробиология [*Agrobiology, Moscow*], *1956*, 1, pp. 126–129, 6 figs., 1956.

In 1954, studies were carried out at the Institute of Genetics, U.S.S.R. Academy of Sciences, Moscow, to select actinomycetes antagonistic to the potato wart organism, *Synchytrium endobioticum* [35, p. 322]. Eight to ten drops of a water suspension of the overwintering zoosporangia of *S. endobioticum* were applied to the surface of each actinomycete culture, grown on nutrient agar in Petri dishes at 25° to 27° C., and the sporangia were studied at intervals. Of the 217 actinomycete strains examined, Nos. 5 to 70, 82, 103, 77, and 137 caused disorganization of the sporangial protoplasm, the changes including colouring, withdrawal from the wall and concentration to one side or at the centre, and loss of granular structure.

These strains proved antibiotic to *Mycob*[*acterium*: *Corynebacterium*] *michiganense*, *Bact*[*erium*] *armeniaca*, and *Deut*[*erophoma*] *tracheiphila*. Nos. 70 and 82 were the most active against *S. endobioticum*, the pigment which they produced readily penetrating the sporangial walls and staining the contents dark blue.

Huber (J.). **Untersuchungen über die schädigende Wirkung des Rhizoctoniabefalles der Kartoffelstaude.** [Studies on the injurious effect of *Rhizoctonia* infection of the Potato plant.]—*Phytopath. Z.*, 27, 1, pp. 73–82, 5 figs., 1956.

The results of studies at the Institute for General Botany of the Friedrich Schiller University, Jena, Germany, confirmed the findings of Hofferbert and Orth [31, p. 454] regarding the marked capacity of *Rhizoctonia* [*Corticium*] *solani* [35, p. 542] to dissolve the tissues of potato plants by means of cellulase and pectinase.

The vessels of diseased sprouts are occluded by a brown mass. After eight weeks the nutrient solution of a Czapek-Dox culture of *C. solani* is found to contain a brown pigment, which obstructed the vessels of sprouts of the varieties Aquila and Capella placed in tubes containing 20 ml. of the filtrate and also favoured the development of a reversible, non-toxigenic wilt. The occlusive substance could be precipitated from the filtrate by the addition of barium hydroxide or lead acetate, both at a concentration of 100 mg. per ml., resulting in loss of the wilt-inducing property. Besides the reversibility of the flaccidity, the absence of necroses in the wilted plants is a further argument for the non-toxigenic character of the brown material.

Since apical rolling and its after-effects can scarcely be of non-toxic origin, the doubt arises whether they are indeed unconditional symptoms of infection by *C. solani*, or whether the latter merely acts as a predisposing factor in the development of a parallel disease.

Emilsson (B.) & Heiken (A.). **Studies on the development and structure of the periderm of the Potato tuber in relation to scab resistance.**—*Acta Agric. scand.*, 6, 2, pp. 229–242, 2 pl., 1956.

Studies in 1954 and 1955 at the Institute for Plant Research, Nyäshamn, Sweden, on the resistance to scab (*Actinomyces scabies*) of 11 potato varieties [33, p. 314] confirmed the conclusions of Cooper *et al.* [33, p. 623] that in general it is correlated with periderm structure, varieties with a type R periderm (composed of living nucleated cells) being resistant, while those with a type S periderm (covered with a mantle of collapsed, defunct cells) are generally susceptible. Konsuragis and Magnum Bonum, which have the R type nuclear condition associated with the S type outer cell degradation, occupy an intermediate position between the most resistant varieties, Ackersegen and Menominee, and the more susceptible ones. Eigenheimer, however, though highly susceptible, could not be included in either periderm type; the nuclei were small but did not degenerate.

Bazán de Segura (Consuelo). **La costra plateada de la Papa.** [Silver scurf of Potato.]—*Bol. Estac. exp. agríc. La Molina* 96, 8 pp., 4 figs., 1955. [English summary.]

This information on silver scurf disease of potato in Peru caused by *Spondylocladium atrovirens* has already been noticed from another source [35, p. 540].

F.A.O. Working Party on Rice Breeding.—*F.A.O. Pl. Prot. Bull.*, 4, 8, pp. 127–128, 1956.

At the sixth meeting of the F.A.O. Working Party on Rice Breeding, held at Penang, Malaya, from 5th to 11th December 1955 [cf. 34, p. 671], standard procedures, based on information supplied by six countries, for breeding for resistance to rice blast [*Piricularia oryzae*] were formulated, details of which are given.

In India a disease resembling the 'penyakit merah' of Malaya [35, p. 712] was most prevalent when oxygen requirements were high, and was associated with the presence of reduction products in the root zone. Phosphate applications, though sometimes helpful, gave inconsistent results. In East Pakistan 'pansuk' [34, p. 671] was associated with stagnant water, and partial recovery was obtained by means of drainage and the use of fertilizers. In Burma 'myit-po' and 'amyit-po' were remedied by application of phosphates and a yellowing was rectified with sulphur or sulphates. In the United States straighthead [34, p. 747] occurs on sandy soil under continuous flooding; it can be partly cured by draining at the critical period, probably corresponding with the time of panicle differentiation.

Analyses of soils from submerged padi fields in which other physiological diseases occurred usually indicated a high iron content and a consistent manganese to iron ratio of under 1:10, which ratio appeared to be more important than the total amount of either element.

In Ceylon physiological disease was correlated with the concentration of the products of reduction; ferrous and manganous ions were the predominating constituents in the drainage water, sometimes being present in concentrations of over 500 and 80 p.p.m., respectively. In Indonesia it appears that any agricultural practice rendering padi soils more permeable to oxygenated water helps to prevent the development of physiological disease and addition of phosphate is beneficial. In Malaya the quantity of iron in solution rather than the total amount in the soil seemed to be an important factor affecting 'penyakit merah' [35, p. 711].

Revilla (V. A.). **El falso carbon del Arroz en el Perú. (Ustilaginoidea virens (Cke.) Tak.)** [False smut of Rice in Peru. (*Ustilaginoidea virens* (Cke.) Tak.)]—*Bol. Estac. exp. agríc. La Molina* 61, 14 pp., 1 col. pl., 1 fig., 1955. [English summary. Mimeographed.]

False smut of rice (*Ustilaginoidea virens*) [cf. 31, p. 83] was first observed in Peru in 1951. It is still confined to the Tumbes Valley but incidence has recently increased. The author describes the symptoms, etiology, and economic importance of the disease and suggests the following methods of control: use of seed from unaffected fields only, seed treatment with compounds such as arasan or granosan M, crop rotation, and replacement of the susceptible Radin China by resistant varieties.

Klement (Z.). **A new bacterial disease of Rice caused by Pseudomonas oryzicola n.sp.**—*Acta microbiol. Acad. Sci. Hung.*, 2, 3, pp. 265–274, 3 col. pl., 4 figs., 1955. [Russian summary.]

The name *Pseudomonas oryzicola* is suggested for the pathogen (1- to 3-flagellate rods measuring 2·5 to 3·5 by 1·3 μ) responsible, together with *Piricularia oryzae*, for the 'brusone' disease of rice in Hungary [30, p. 487]. It differs from *Xanthomonas oryzae* [35, p. 547] and *Pseudomonas itoana* [11, p. 535] in liquefaction of gelatin, reduction of nitrate, production of ammonia, formation of hydrogen sulphide and indole, action in litmus milk, and sugar decomposition. The bacterium affects the leaves sheathing the panicles; the stems, producing blurred spots later turning dark brown or black; the nodes; and the panicle itself, the husks of which become brown and the seeds sterile. The symptoms were reproduced by artificial inoculations. The bacterium, the behaviour of which in culture is fully described, forms white colonies and produces a green, fluorescent pigment in culture.

Peries (O. S.). **Report of the Mycology Department for the year 1955.**—*Rep. Rubb. Res. Bd Ceylon, 1955*, pp. 70–81, 1956.

In this report [cf. 35, p. 392] it is stated that during 1955 somewhat extensive

leaf fall was caused to rubber on some estates in Ceylon by *Gloeosporium albo-rubrum* and *Phytophthora palmivora*, the widespread incidence of which was attributable to the abnormally wet weather conditions that prevailed during most of the year. There were also indications that *Fomes lignosus* will become a major problem very soon if precautions are not taken to eradicate it.

Oidium heveae [loc. cit.; 35, p. 790] is now under good control on estates where the measures recommended [34, p. 543] are practised. Dusting should start when 10 per cent. of the trees show new growth. In certain areas, after successful control of *O. heveae*, exposure to very wet conditions resulted in an attack by *G. albo-atrum* [cf. loc. cit.], producing a characteristic die-back of the leaves from the edges and 'drip-tip', from which the condition derives its common name, 'rim blight'. Advanced infections showed the characteristic pinkish pustules along the midrib and veins. In many instances the attacks and resultant leaf fall were confined to young leaves on the lower branches, which received little or no sunlight.

Defoliation of lower branches during continuous wet weather early in the year was due solely to shading. The leafless branches in many cases atrophied and died back to the main stem. This type of leaf fall was particularly noticeable in closely planted areas of young budded and seedling rubber.

Leaf fall caused by *P. palmivora* [loc. cit.] was general in June on some estates, continuous wet weather having set in early. A number of cases of infection on young plants in the field and nursery were reported. The attack was arrested by cutting out and destroying all infected material and spraying several times with perenox at 4 oz. per 10 gals. of water. Bark rot and canker were prevalent on most estates, canker sometimes reaching epidemic proportions. Attempted control failed in every instance because of incorrect use of fungicides and inadequate treatment of the primary foci of infection.

Material infected by *F. lignosus* [cf. 35, p. 392] was received both from estates and small holdings, this together with field observations in replanted areas indicating that white root disease can become serious in replantings if not eradicated when the old stands are uprooted. Many young plants were killed in replantings where the original stand appeared unaffected.

The Kestrel dusting machine, tested in 1955, promises to become very popular. It can easily be carried by two men, and its cost compares favourably with that of the other machines used [35, p. 790]. The model now available in the market is fitted with a 2·2 h.p. B.S.A. engine, weighs 80 lb. unloaded, and has a hopper capacity of 40 lb.

Records made by means of a Hirst automatic volumetric spore trap [34, p. 664] indicated that the release of the spores of *O. heveae* in the field is regulated by a diurnal rhythm, the most uniform daily concentration of spores generally being recorded between 11 a.m. and 3 p.m. Relative humidity and wind velocity were found to be correlated with this rhythm, spore concentration being at its peak when relative humidity was low and wind velocity high. Minimal concentrations occurred after sunset and during the early morning, when these conditions were reversed.

Young (H. E.). **Bark rot and canker of the Rubber tree.**—*Adv. Circ. Rubb. Res. Inst. Ceylon* 54, 8 pp., 1955.

In this publication, which supersedes Circular No. 21, brief practical notes are given on stripe canker (*Phytophthora palmivora*) [cf. 24, p. 385 and preceding abstract] and coloured canker (*Pythium complectens* [cf. 34, p. 584], often in association with *Phytophthora palmivora*) of *Hevea* rubber in Ceylon, with particular reference to symptoms, damage caused, manner of infection, and control by preventive and curative measures.

Manil (P.), Culot (J. P.), & Brouwers (L.). **Contribution à l'analyse du sol par voie microbiologique.** [A contribution to the analysis of soil by a microbiological method.]—*Bull. Inst. agron. Gembloux*, 24, 2, pp. 142–207, 21 graphs, 1 diag., 1956.

The results are presented of experiments conducted at the Agricultural Institute Gembloux, Belgium, from 1950 to 1954 on soil analysis by a microbiological method employing *Aspergillus niger* [cf. 33, p. 588]. The method consisted in growing the test organism in a liquid culture medium complete but for the element for which the test is made, this being supplied by a weighed specimen of the soil it is desired to analyse. The development of the test organism as a function of increasing dosages of an element is determined previously, from which it is possible to calculate, by weight of mycelium developing in a soil sample, the amount of the element present in it.

The microbiological method deserves to be more widely used, especially for phosphorus, as it gives relatively constant results, determines the amount of organic phosphorus present, and is easy and inexpensive to carry out. The main part of the paper is followed by a statistical analysis of the results by P. Dagnelie (pp. 196–201), and there is, in addition, a brief account (pp. 202–206) of certain complementary experiments, further details of which are to be published later.

Nicot (Jacqueline). **Observations sur la mycoflore du sol du bois des Rièges (Camargue).** [Observations on the soil mycoflora of the Rièges forest (Camargue).]—*C. R. Acad. Sci., Paris*, 243, 11, pp. 820–822, 1956.

The examination of sandy soil collected in 1949 and 1951 from the juniper (*Juniperus phoenicea*) forest of the Rièges, Camargue, France (stated to be the only one of any importance in the country), revealed a comparatively rich fungus flora and a large variety of species [cf. next abstract], a further account of which is to be published in *C. R. 6me Congr. int. Sci. Sol*, III, Biologie, Paris, 1956. Mention is made here of a new species, *Haplosporangium gracile* [without a diagnosis], and of the complete absence of *Trichoderma viride*.

Montégut (J.). **Premières observations sur la mycoflore des sols sablonneux des Landes de Gascogne.** [Preliminary observations on the mycoflora of the sandy soils of the Gascony Landes.]—*C. R. Acad. Sci., Paris*, 243, 16, pp. 1144–1146, 1956.

Of the species of fungi (over 250) isolated from collections made in 1954 in the dunes of Gascony, France [cf. preceding abstract], 82·5 per cent. were Fungi Imperfecti, including 1·5 per cent. *Aspergillus*, 27 per cent. *Penicillium*, 3 per cent. Moniliaceae, 10 per cent. Dematiaceae, 5·5 per cent. *Fusarium*, 3 per cent. Tuberculariaceae, 1 per cent. each of Stilbaceae and Melanconiales, 10 per cent. of Sphaeropsidales, and 2·5 per cent. of sterile mycelia. Phycomycetes were represented by 6 per cent. of the isolates, Ascomycetes by 11 per cent., and Basidiomycetes by 0·5 per cent. Only four species, namely, *Cladosporium herbarum*, *Trichoderma viride*, *P. thomii*, and the rather unusual *P. pulvillorum*, were common to all the five ecological stations explored. The distribution of the various groups is discussed in relation to environmental conditions.

Domsch (K. H.). **Die Kultivierung von Bodenpilzen auf bodenähnlichen Substraten.** [The culture of soil fungi on soil-like media.]—*Arch. Mikrobiol.*, 23, 1, pp. 79–87, 1 diag., 2 graphs, 1956.

In laboratory studies at the Kiel-Kitzeberg (Schleswig-Holstein) branch of the German Biological Institute the growth of *Rhizoctonia* [*Corticium*] *solani* and other soil fungi on acid peat mould, washed sea sand with grains 0·2 to 0·5 mm. in

diameter, and various horticultural soil types [35, p. 486] was measured by colony diameter [cf. 33, p. 367].

At a temperature range from 7·5° to 30° C. the growth rates of *C. solani* on soil and on solid and liquid media were approximately equal. The fungus made good growth on peat mould, little or no benefit being derived from a supplement of glucose or peptone. *C. solani* grew best on peat mould at a pH (after the second sterilization) of 6·7 and *Pythium debaryanum* at 6·5. An admixture of 4 per cent. malt extract and 0·5 per cent. peptone afforded a powerful stimulus to the development of *C. solani* on sand, the whole dish being covered in two days at 25°. Uniform growth was made on peat and sand mixed in varying proportions, but measurements were not taken. Of the various garden soils tested, manured soil was the most favourable to *C. solani*, followed by compost, and leaf mould the least so. Of 12 [unnamed] fungi isolated from compost, one made no growth on the same medium, three fair, six good, and two very good, but in no case did their development equal that of *C. solani*.

Using the antagonistic couples *Bacillus subtilis–C. solani* and *Penicillium chrysogenum–B. mycoides* as examples of the variety of interrelations between soil organisms, the author demonstrated the marked differences in their behaviour on agar, sand, sand-peat mixture, and compost (on which there was, in fact, no antibiosis at all). Hence it is argued that conclusions from laboratory experiments regarding the development of soil fungi in their natural environment can only be drawn if the *in vivo* conditions are chosen with due consideration of essential soil factors.

Welvaert (W.) & Veldeman (R.). **Schimmelflora van klei- en bosgrond.** [Fungus flora of clay and forest soils.]—*Meded. LandbHogesch. Gent*, 20, 2, pp. 193–210, 1955. [French and English summaries.]

This is a fully tabulated report of studies on the fungi isolated on Czapek-Dox and other media from numerous samples of clay and forest soils in Belgium. In both types the numbers were comparatively high at a depth of 60 cm., *Mortierella* M 14 (designated *M. nana* at the Centraalbureau voor Schimmelcultures) being the predominant species in the forest (181 out of 219 isolates), followed by *Penicillium* (15) and *Trichoderma* (10). The principal species at the same depth in clay were of *Penicillium* and *Aspergillus*, followed by Mucoraceae, while *Penicillium*, *Trichoderma*, Mucoraceae, and *Fusarium* were also represented in the upper layers (with *Verticillium* to a depth of 20 cm.). There was altogether a much greater variety of species in the clay than in the forest soils, a fact attributed largely to the stronger antagonistic activity of *Trichoderma* and *Penicillium* spp. in the acid medium (pH 4·3) of the latter than in the alkaline one (pH 7·5 to 7·8) of the former.

Roistacher (C. N.) & Baker (K. F.). **An inexpensive multipurpose soil steamer.**—*Phytopathology*, 46, 6, pp. 329–333, 3 diags., 1 graph, 1956.

An inexpensive, multi-purpose soil-steaming unit has proved effective during the past seven years at the Department of Plant Pathology, University of California, Los Angeles, in the elimination from heavily infected soil of numerous fungal and bacterial pathogens and tobacco mosaic virus. It consists of a resin-impregnated, marine plyboard box, $42 \times 42 \times 52$ in., with a capacity of approximately 21 cu. ft., designated to accommodate either bulk soil, 16 flats (18 by 18 by 3 in.), or 150 to 1,000 7- or 4-in. empty pots. A grid of pipes (the upper part of which can be shut off if desired) with regularly placed orifices is located in such a way that no soil particle is more than 6 in. from steam sources, so that a temperature of 212° F. is reached in about 30 minutes in fairly moist soil with a steam flow of roughly 175 lb. per hour (5 delivered boiler h.p.) and this can be easily maintained for the same period.

The apparatus is fully described and illustrated.

Poole (D. D.). **Aerial stem rot of Sesame caused by Helminthosporium sesami in Texas.**—*Plant Dis. Reptr*, 40, 3, p. 235, 1956.

Helminthosporium sesami caused an aerial stem rot of sesame plants [cf. 30, p. 344] of the newly introduced Venezuelan variety Guacara growing in a breeding nursery near College Station, Texas, in 1954. The disease is a new record for this host in the United States. The stem lesions range from small flecks to large, sunken, dark brown spots 10 by 40 mm., sometimes coalescing. Small spots may appear at the base of the pedicel, or large lesions may envelop the capsule. Leaf lesions vary from small (1 mm. diameter) to large and elongated (2 by 20 mm.) and, if extensive, cause premature defoliation.

Cairaschi (M. E.-A.). **La 'mosäique chlorotique', nouvelle maladie à virus du Houblon en Alsace.** ['Chlorotic mosaic', a new virus disease of Hops in Alsace.]—*C. R. Acad. Agric. Fr.*, 40, 2, pp. 77–79, 1954.

The author gives a further description of the chlorotic virus disease of hops found in Alsace [cf. 11, p. 423; 33, p. 631], this being apparently its first record in continental Europe. Symptoms included yellow or yellowish-green patches on the leaves, becoming necrotic at the centre with age, shortening of the internodes, and the flowers produced singly instead of in cymes in severe cases. Shaded leaves do not develop symptoms. Affected leaves tend to roll back and become more or less cordate.

The author considers that aphids are the most likely vectors.

González Alonso (M.). **Efectos de las deficiencias minerales sobre algunas plantas medicinales.** [Effects of mineral deficiencies on certain medicinal plants.]—*Farmacognosia*, 15, 35–36, pp. 3–48, 4 col. pl., 8 figs., 13 graphs, 1955. [Received 1956.]

In the greenhouse experiments at the J. C. Mutis Institute, Madrid, effects of mineral deficiencies were examined on *Foeniculum vulgare*, *Melissa officinalis*, peppermint (*Mentha piperita*), and the hybrid *M. sativa* growing in sand cultures supplied with nutrient solutions. Except in the case of *M. sativa*, where there was a decrease, deficiencies caused the epidermal cells to increase in size. Stomatal frequency was higher in deficient melissa and peppermint and on the upper leaf surfaces only of *M. sativa*. In peppermint the numbers of glands increased, while in *M. sativa* they decreased. In *F. vulgare* and melissa the essential oil content increased with all deficiencies, but in peppermint and *M. sativa* it decreased, except with potassium deficiency. In melissa phosphorus deficiency produced a typically reddish colouring, which was especially noticeable on the lower surface of the leaves.

Behr (L.). **Der falsche Mehltau am Mohn (Peronospora arborescens (Berk.) de By.). Untersuchungen zur Biologie des Erregers.** [Downy mildew of Poppy (*Peronospora arborescens* [Berk.] de By). Studies on the biology of the causal organism.]—*Phytopath. Z.*, 27, 3, pp. 289–334, 23 figs., 1956.

This is a comprehensive report of studies on the biology of downy mildew (*Peronospora arborescens*) of opium poppy [9, p. 268 *et passim*] at the Phytopathological Institute of the Martin Luther University, Halle-Wittenberg, preceded by a survey of previous literature on the history of the cultivation of the crop and the symptoms and geographical distribution of the disease.

The pathogen has extended its range in central Germany with the intensified cultivation of the crop during the past decade. In the summer of 1951, for instance, the disease was responsible for a reduction of some 40 per cent. in the crop of a field covering 1 ha. near Aschersleben, and comparable losses have been notified from nurseries.

Inoculation experiments were performed on the under sides of the leaves of

young potted plants (*in situ* or detached) with a dense, aqueous suspension of fresh conidia. After 18 hours at a temperature of 19° C. the conidia had germinated on numerous lacerations of the epidermis and the germ-tubes had penetrated into the interior, forcibly rupturing the cuticle and cell walls. The discoloured, oily to transparent lesions developing on the invaded leaves were seen to consist of collapsed epidermal cells scattered over the under side, and the disappearance of chlorophyll from the mesophyll was already far advanced. The only species reacting positively to inoculation among a small number of Papaveraceae were the opium poppy itself and *Papaver setigerum*. These results are at variance with those obtained by other workers [cf. 13, p. 31] but may be explicable on the basis of physiologic specialization within the fungus, as suggested by Gäumann [3, p. 241]. According to Bontea (Ciuperci parazite şi saprofite din Republica Populară Română, published by Acad. Repub. Pop. Rom, 1953), *P. rhoeas* and *P. dubium* are also hosts of downy mildew in Romania, and the author was notified *in litt.* of the disease on *P. caucasicum* [cf. 13, p. 445] in Germany.

The mean conidial dimensions of 11 collections of *Peronospora arborescens* were 22·8 by 19 μ, with extremes of 19·8 by 18 and 24·2 by 19·4 μ. The collection fell into four size groups, each representing a geographical association and pointing to the likelihood of physiologic specialization in central Germany. The optimum temperature for conidial germination was 19° (31·6 per cent.), the corresponding figures after 72 hours at 23°, 15°, and 2° being 27·3, 17·6, and 21·8, respectively. Viability was maintained for 11 days if the conidia were left on the leaves and stored at 2°. A high degree of atmospheric humidity is the decisive factor in the establishment of infection, the optimum temperature ranging from 12° to 17°. In the field the heaviest outbreaks develop when cool, rainy weather prevails at the time of seed germination.

Hyphal growth in the leaves is intercellular; it never involves the cells of the upper or lower epidermis but results in foliar hypertrophy. All attempts to secure germination of the abundant oospores were fruitless, and they are considered to play no part in the overwintering of the parasite. Diseased capsules are the source of the annual infection of poppy fields, and since the pathogen perennates in the seed endosperm, its relationship with its host should be designated a cyclic parasitism.

Warning to Cane growers. Outbreak of disease new to Natal.—*S. Afr. Sug. J.*, 40, 10, p. 777, 2 figs., 1956.

South African cane-growers are warned that gumming disease [*Xanthomonas vasculorum*: map 3] has been detected in Natal. Further particulars are to be circulated, but in the meantime the symptoms are very briefly described and illustrated to assist in recognition. Attention is also drawn to the rapidity of spread of the pathogen and its transmissibility by human agency.

Schexnayder (C. A.). **The effect of stunting disease of Sugarcane on yields of Cane and sugar in Louisiana, and the use of heat treatment for control.**—*Sug. Bull., N. Orleans*, 34, 22, pp. 349–355, 1 fig., 1 graph, 1956.

A tabulated survey is given of the results of experiments in 1953–4 on the control of ratoon stunting virus disease of sugar-cane by eight hours' exposure to hot air (54° C.) at the U.S. Sugarcane Field Station, Houma, Louisiana [see above, p. 2]. Response of seed cane to the curative effects of the treatment was particularly marked in the older commercial varieties, e.g., Co. 281, Co. 290, C.P. 34/120, and C.P. 29/320, the yields of which (in tons per acre) were increased by 67, 31, 32, and 69 per cent., respectively. There was a highly significant decrease of 8 lb. sugar per ton (average of 28 varieties) in the heat-treated seed canes, which is considered, however, to be outweighed by the increased tonnage per acre.

VEIGA (F. M.). **Notas sôbre o raquitismo das socas em Campos.** [Notes on ratoon stunting at Campos.]—*Bras. açúc.*, 47, 1, pp. 81–83, 2 figs., 1956.

The existence of the ratoon stunting virus of sugar-cane [see preceding abstract] in the State of Rio de Janeiro, Brazil, was demonstrated in November, 1953, by the positive results of sap transmission experiments at the Campos Experiment Station. The least susceptible variety was CB. 45–3, followed by Co. 419 and CB. 41–76; CB. 46–40 and CB. 36–24 were heavily attacked and H. 32–8560 was totally destroyed.

Experiments on the control of the disease by heat are in progress, and the beneficial effects of the treatment on the ratoons were already apparent at the time of writing.

CHRISTENSEN (C. M.). **Common fleshy fungi.** vii+246 pp., 9 pl., Minneapolis Burgess Publishing Co., 1955. [Mimeoprinted.] $3.00.

This handbook is designed for use in the field by beginners collecting the larger fungi and includes keys for nearly 250 common species of agarics as well as 150 common fleshy species of other basidiomycetes and ascomycetes. Only macroscopic characters are used in the keys and technical terms are avoided where possible. There is a bibliography of 23 titles of American and British books on the higher fungi.

LENTZ (P. L.). **Stereum and allied genera of fungi in the Upper Mississippi Valley.**—*Agric. Monogr. U.S. Dep. Agric.* 24, 74 pp., 16 pl., 1955.

In this monograph 26 species of *Stereum* and closely related fungi found in the Upper Mississippi Valley are described and illustrated. All the stipitate species are included in *Cotylidia*, and *S. rufum* in *Cryptochaete*. The new genus *Loxitextum* was erected to accommodate *Thelephora bicolor*, *T. crassa*, and *T. roseo-carnea*. Among the economically important *Stereum* species attacking living trees in the area are *S. purpureum*, *S. sanguinolentum*, *S. gausapatum*, and *S. subpileatum*.

HUNT (J.). **Taxonomy of the genus Ceratocystis.**—*Lloydia* 19, 1, pp. 1–58, 4 pl., 1956.

In this extensive study at the Division of Forest Disease Research, Portland, Oregon, of herbarium and fresh material and cultures of species of *Ceratocystis* [32, p. 453] the author reviews the history of the genus and its synonymy, and provides a generic diagnosis, a key to the 39 recognized species, which are described in detail, the original descriptions of 11 imperfectly known species, and 80 references to the literature. One new name and 15 new combinations are made, including *C. fagacearum* (syn. *Endoconidiophora fagacearum*), *C. multiannulata* (syn. *Ceratostomella multiannulata*) [33, p. 636], *Ceratocystis montia* (syn. *Ceratostomella montium*) [loc. cit.], *Ceratocystis minor* (syn. *Ceratostomella minor*, *C. exigua*, *C. pini*, and *C. pseudotsugae*) [loc. cit.], and *Ceratocystis narcissi* (syn. *Ophiostoma narcissi*) [29, p. 562]. *C. longirostellata* [30, p. 497] is considered to be a synonym of *C. capillifera*, *C. wilsoni* [loc. cit.] and *E. bunae* [34, p. 416] of *C. moniliformis*, *E. virescens* [24, p. 37] of *C. coerulescens*, and *Ceratostomella querci* of *Ceratocystis piceae*. Two names are excluded.

The genus is divided into three sections: (1) species with an endoconidial imperfect state; these are subdivided on ascospore shape; (2) those with (*a*) *Leptographium* or (*b*) *Graphium* imperfect state; and (3) species with mycelial conidia only; (2) and (3) are subdivided on the presence or absence of ostiolar hyphae and the length of perithecial neck.

BIGA (M. L. B.). **Riesaminazione delle specie del genere Albugo in base alla morfologia dei conidi.** [Re-examination of the species of the genus *Albugo* on the basis of conidial morphology.]—*Sydowia*, 9, 1–6, pp. 339–358, 1955. [English summary.]

A study at the Botanical Institute, University of Pavia, Italy, of the sporangial

measurements of 226 specimens from 125 host species infected by *Albugo* led the author to recognize two intraspecific taxa of *A. candida*, namely, var. *candida*, with sporangia 12·5 to 15 μ in diameter, and var. *macrospora* Togashi with sporangia 15 to 17·5 μ; and two of *A. ipomoeae-panduratae* [27, pp. 176, 347], namely, var. *ipomoeae-panduratae*, with sporangia typically 15 to 17·5 μ and var. *tiliaceae* n. var., with sporangia typically 20 μ. Similarly, five new varieties of *A. tragopogonis* [33, p. 141] are recognized.

An analytical key of all the known species (with all ascertained hosts) is drawn up from the literature. A number of new combinations necessitated by the use of *Albugo* are made. Six names are excluded.

HEIM (PANCA). **Le noyau dans le cycle évolutif de Plasmodiophora brassicae Woron.** [The nucleus in the life-cycle of *Plasmodiophora brassicae* Woron.]—*Rev. Mycol., Paris*, 20, 2, pp. 131–157, 1 pl. (facing p. 196), 17 figs., 1955.

A detailed account is presented of the author's study in [the Laboratory of Plant Biology of the Sorbonne] Paris, on the life-cycle of *Plasmodiophora brassicae* [on an unspecified host], with special reference to the nuclei and their divisions and spore formation and germination. The young plasmodia produce fine pseudopodia which pass into neighbouring cells by penetrating the wall. Eventually the nuclei pair. The mature plasmodium has a regular contour and does not develop pseudopodia. When it is fully grown three simultaneous nuclear divisions occur, the first two being meiotic. After the first division the plasmodium separates into naked uninucleate portions; cell divisions accompany the subsequent nuclear divisions to give the spores. The haploid number of chromosomes is eight. The spores are able to germinate *in situ* giving myxamoebae which unite to form a young plasmodium capable of infecting regions still healthy. Thus, the fungus can complete its life-cycle entirely within a parasitized organ.

PORTSMOUTH (G. B.) & WEBSTER (B. N.). **Protection of Ceylon Tea from blister blight.**—*Pamphl. Tea Res. Inst. Ceylon* 2, 10 pp., 1955.

This publication recapitulates the general practices for control of blister blight (*Exobasidium vexans*) of tea in Ceylon [35, p. 238 *et passim*], most of which have been noticed in this *Review*. Copper oxide and oxychloride sprays have been found equally effective and should be used at 6 oz. per acre. Nurseries should be sprayed every four days with a 50 per cent. copper fungicide at 4 oz. to 10 gals. water, and tea recovering from pruning with 6 oz. of 50 per cent. copper fungicide per acre, up to tipping. Tea in plucking should be sprayed every seven to ten days. As an alternative, dusting may be employed, 5 lb. of 4 per cent. copper dust per acre every 8 days being satisfactory with a good coated dust.

GLOVER (P. M.). **Power spraying of Tea using a tractor mounted sprayer and area spraying technique.**—*Two & a Bud.* (*News Lett. Tocklai exp. Sta.*), 2, 4, pp. 8–10, 1955.

Tea in north-east India is generally sprayed with pneumatic knapsack sprayers; using low volume nozzles a team of 15 men can cover only four to six acres per day, or eight to ten acres for young tea or a top spray only. To expedite spraying Tocklai Experiment Station [35, p. 399] have been carrying out trials with a Four Oaks tractor mounted sprayer with a 60 gals. tank and pressures up to 160 lb. per sq. inch.

For young tea a modified Four Oaks Marvellous nozzle or the Fan Jet C. 60, with a standard lance, and a pressure of 40 to 60 lb. per sq. in. are recommended. Continuous spraying empties the tank in 2¼ hours, but in practice a full tank lasts 3 to 3½ hours. Mature tea may be sprayed at 120 to 160 lb. per sq. in., which throws the spray effectively to 15 ft. Preliminary figures indicate that at least 8 to 12 acres can be covered per day by five men.

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